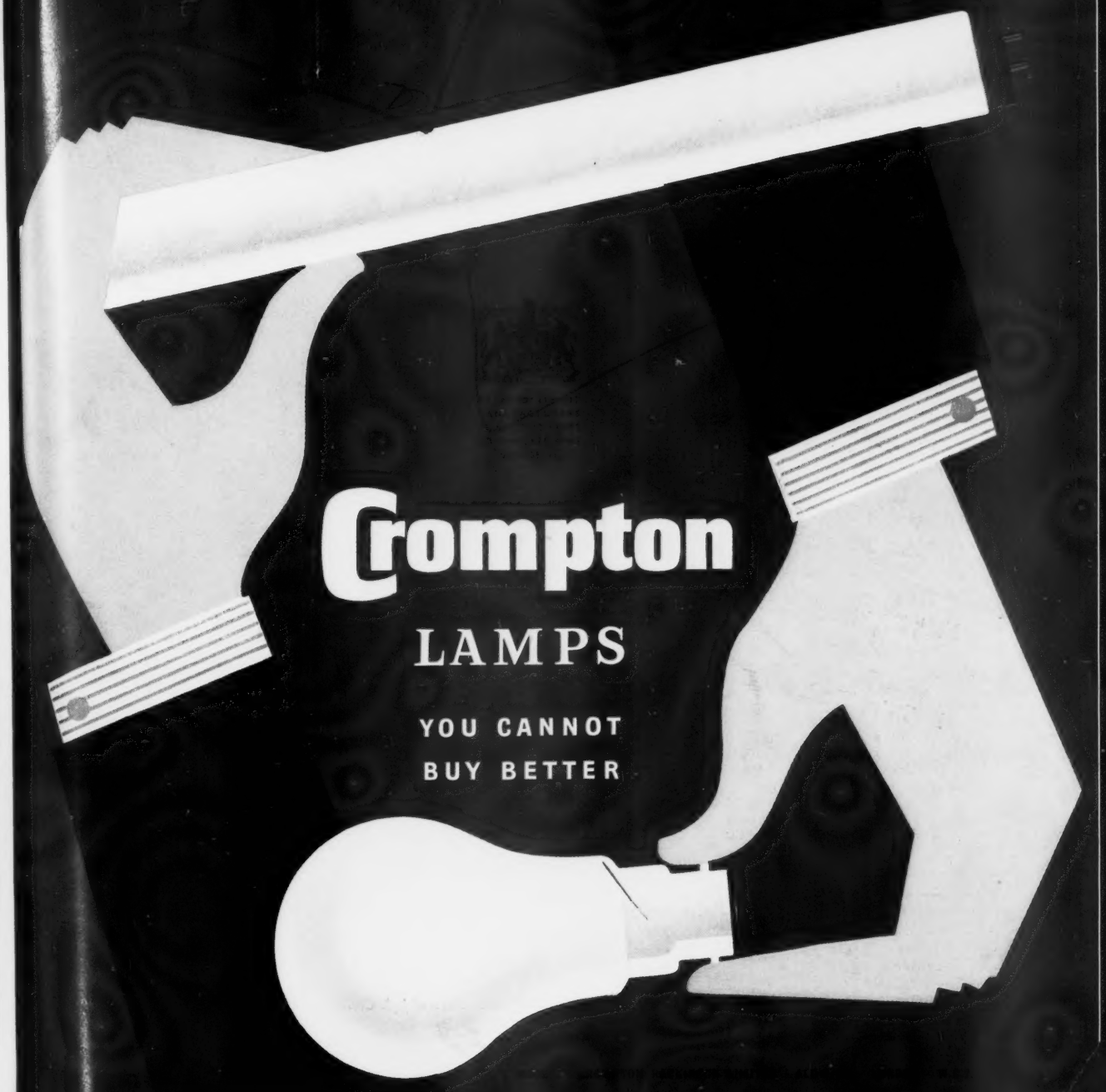
ELECTRICAL REVIEW

OCTOBER 1954 ONE SHILLING



D-6

THE STURDY, RELIABLE, SMALL STARTER

- Ready Adjustment to Motor Current on Site
- Automatic 'Free Handle' Release
- Easy From-the-front Wiring and Fixing
- Visual (Push-button) Indication
- Exceptionally Small Size
- Adjustable Thermal Overloads with Ambient Temperature Compensation
- Full, Positive Action
- Built-in, Flush and Surface Patterns

CRABTREE

WIRING ACCESSORIES · SWITCHGEAR · MOTOR STARTERS

"Crabtree" (Registered)

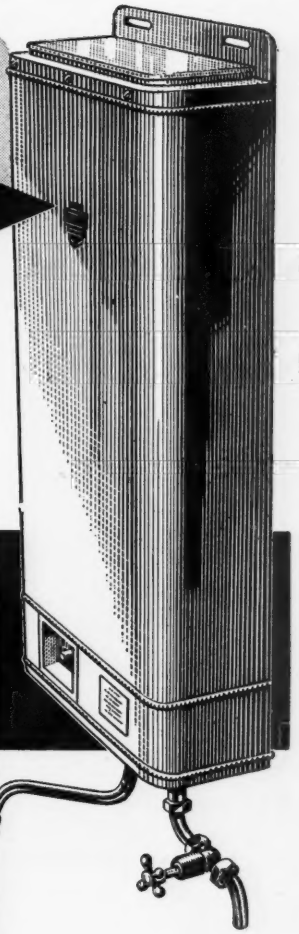
C.698/249. Advt. of J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall, Staffs.

Simplicity—

the Hallmark of Genius

Heatrae

REGISTERED TRADE MARK



electric water heaters

Heatrae type S.E.B. Electric Water Heater is intended for occasional use in the bathroom. It is especially designed to provide a quick supply of hot water.
Once switched on, the heater can be left for successive baths, as thermostatic control removes any danger of boiling.

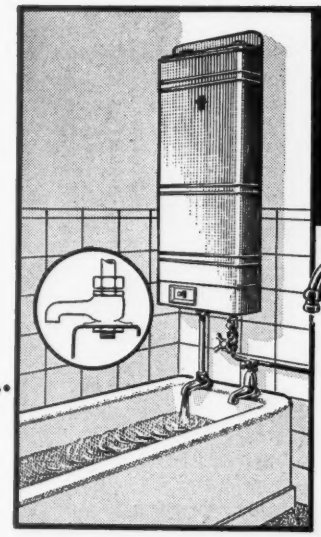
The **S.E.B.** is beautifully finished in white enamel with chromium plated fittings. Rectangular in shape, it occupies minimum space.

Capacity: 12 *gallons.*

This is one of a wide range of Heatrae Electric Water Heaters.

There is a standard type available to meet almost any set of working conditions.

Please send us details of your requirements and we will make you the most suitable offer.



so simple to **install**

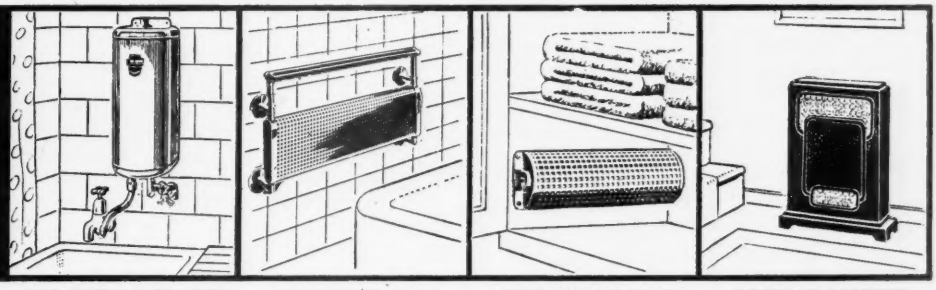
so simply **serviceable**

are so simple...

Heatrae

30 years specialised experience in designing and manufacturing of Electric Water Heaters

Here are some of the extensive range of our products for industrial and domestic uses...



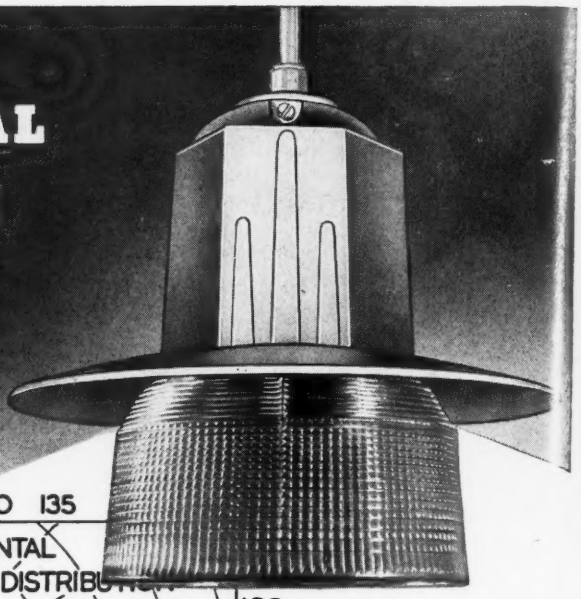
• D.O.T. ELECTRIC WATER HEATER • AIR WARMER/TOWEL RAIL • AIRING CUPBOARD HEATER • ELECTRIC AIR CONVECTOR

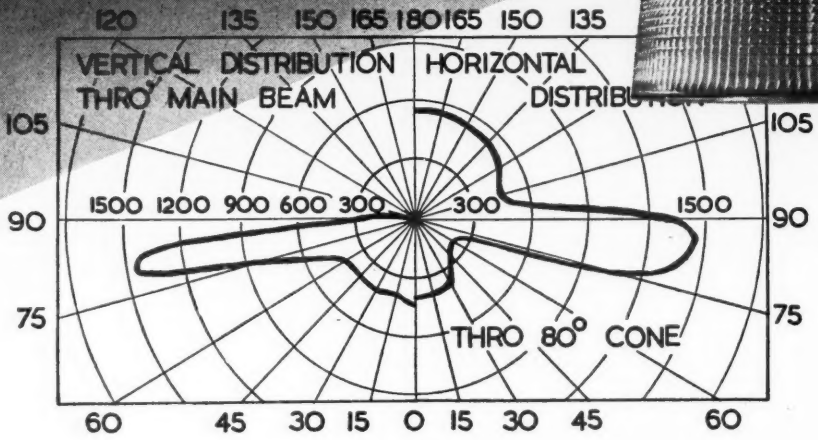
Advertisement issued by HEATRAE LTD · NORWICH · ENGLAND

Manufacturers of: Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flameproof Heating Apparatus, Breakfast Cookers, Electric Fires, Food Trolleys, Warming Plates, Air Heaters.

A

GREAT OPTICAL PERFORMANCE





PLUS THESE OUTSTANDING FEATURES!

The 'Welwyn' one of the series of street lighting lanterns designed by Eleco is made for 100–200 watt Tungsten, or 80–125 watt Mercury Discharge Lamps. The 'Welwyn' beside giving the highest degree of optical performance—will give years of trouble-free service with a minimum of maintenance.

Here are some of the reasons why:

1. The lantern is made in only 3 main parts: die-cast aluminium body; the lamp holder bridge assembly; dome type refractor.
2. The refractor and focal position stops are cast with the body.
3. The lamp holder bridge and lamp holder can be removed by loosening focal stop screws and turning slightly.
4. Single piece glass dome refractor (available for axial or non-axial distribution) gives maximum light control and high output.
5. The refractor is firmly held in correct relation to the body, by solid internal spring loaded clips.
6. These springs are enclosed within the body casting—completely protected from the weather.

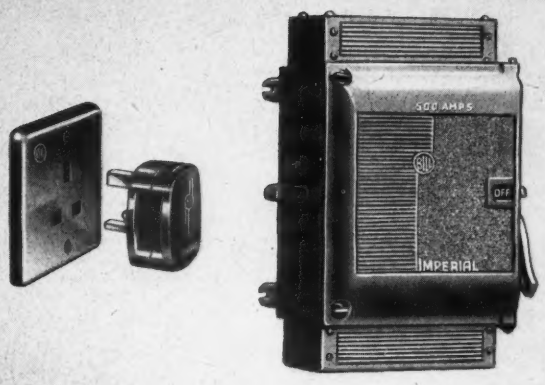
ELECO

ENGINEERING & LIGHTING EQUIPMENT CO. LTD

SPHERE WORKS · ST. ALBANS · HERTS

BILL
YOU CANNOT BUY BETTER GEAR

You cannot buy better gear



BILL COMPLETE RANGE
13 AMP SOCKET OUTLET TO 500 AMP FUSE SWITCH

★ SOCKET OUTLETS
★ COOKER SWITCHES
★ DISTRIBUTION BOARDS
★ SWITCHES AND SWITCH FUSES
★ INDUSTRIAL PANELS

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM 20

LONDON, S.W.1. A. W. ZELLEY. 8 PETER ST.
MIDLANDS. G. H. GARBETT. HEAD OFFICE.
NORTH MIDLANDS. C. G. BACHELOR. HEAD OFFICE.
CHELTENHAM C. GEARING. LECKHAMPTON HILL
MANCHESTER 3. H. H. POLLARD. WOOD STREET.
BRISTOL 3. W. L. WHITE. CHURCH LANE.
LEEDS 2. N. SHARPLES. 2 LOVELL RD.
GATESHEAD 8. S. J. DAVIS. 252 PRINCE CONSORT RD.
GLASGOW J. D. HARRIS. ST VINCENT LANE

JUST WHAT THEY WANT IN

SHOPS, OFFICES AND HOMES

The Memvair Convector

Memvair convector heaters bring the comfort of central heating at the touch of a switch. Here is beautifully designed heating equipment that will appeal equally to the business and domestic user. And Memvair convectors are offered at the right prices to bring you quick, easy sales. Here at a glance are their attractive features.

- **Substantial construction**
- **Very small floor area**
- **Smooth unbroken surfaces for easy cleaning**
- **Attractive finish in bronze with burnished copper surround to protective grille**
- **Appearance enhanced by internal illumination when in use**
- **With or without thermostat control**
- **Made in 3 ratings 1 kW, 1½ kW and 2 kW**

Send for MEM Convector folder No. 352.

MEM

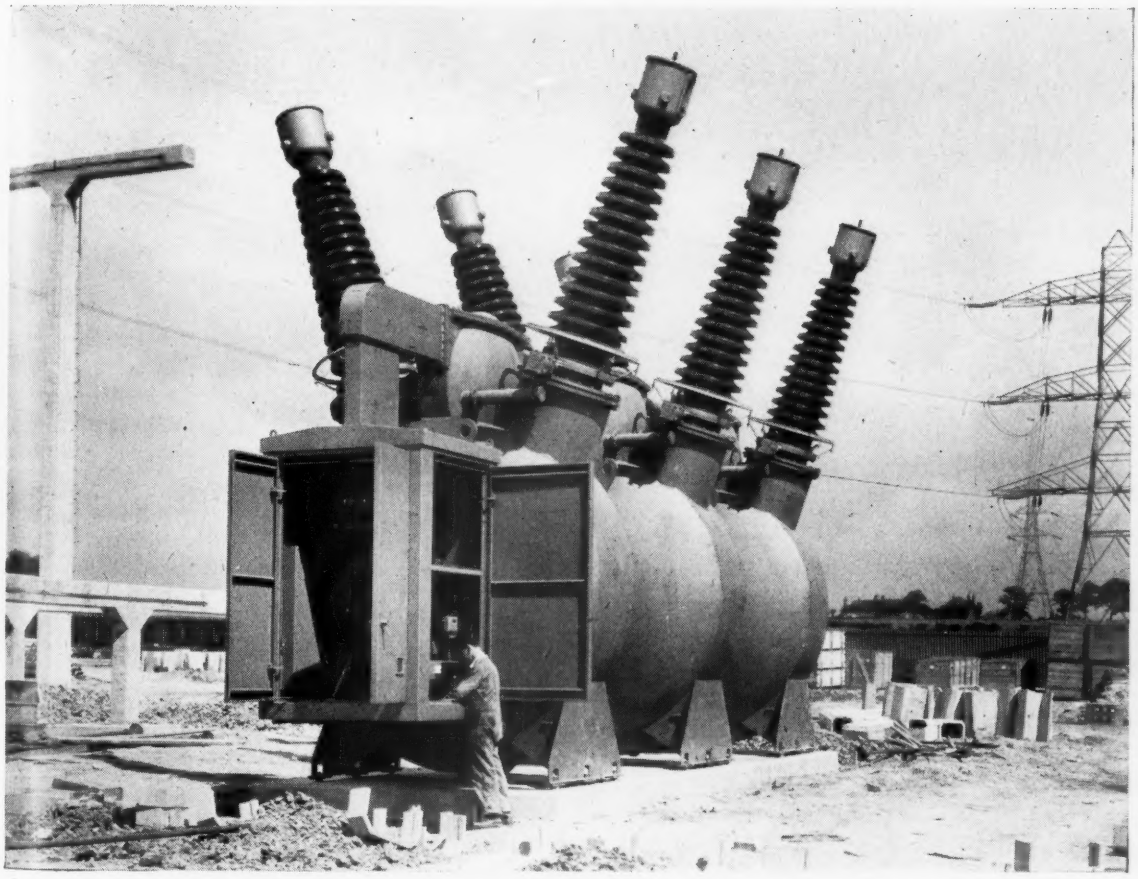
Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11. *Branches in London and Manchester.*

The first of
SEVENTEEN

B
T-H

275 kV, 7500 MVA Shuntarc Oil Circuit Breakers
For the **B.E.A. Super Grid**



The illustration shows erection in progress at West Melton Substation

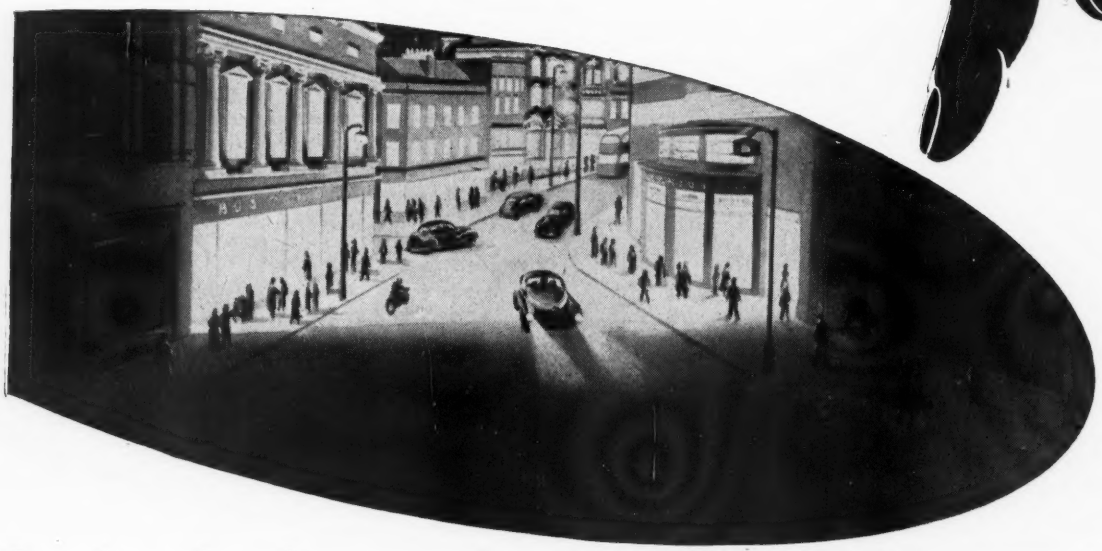
BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

Member of the AEI group of companies

A4848N

Was this YOUR fault?



Don't take chances - choose METROVICK protection

The fault may be *yours*—if a small fault becomes a big fault through inadequate protection. Engineers today ensure safety for feeders and transmission lines by installing Metrovick relays, which are available to suit many different protective systems. Our technical staff will be pleased to give advice on any aspect of protection for electrical equipment.

Metrovick relays for protecting feeders and transmission lines :

LONGITUDINAL DIFFERENTIAL
(*a*) Translay
(*b*) High speed balanced voltage

TRANSVERSE DIFFERENTIAL (parallel feeders)
(*a*) Translay
(*b*) High speed balanced current

DISTANCE (IMPEDANCE)
(*a*) High speed (stepped characteristic)
(*b*) Time graded (linear characteristic)

" CONTRAPHASE " PHASE COMPARISON USING CARRIER PILOT CHANNEL

TIME-GRADED OVERCURRENT AND/OR EARTH-FAULT
(*a*) Inverse time with definite minimum
(*b*) Definite time

INSTANTANEOUS HIGH-SET OVERCURRENT

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the AEI group of companies

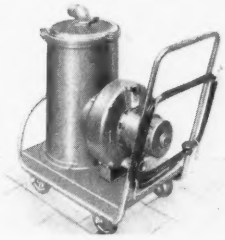
Safeguarding Electrical Equipment

G/A 405

Sturtevant
Industrial Vacuum Cleaners

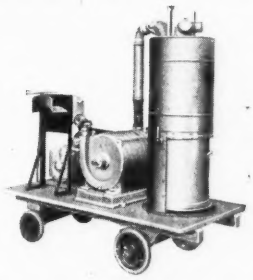
used for a wide variety of cleaning duties in 48 countries!

No. 4

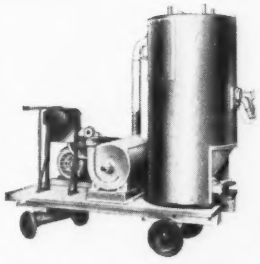


No. 4x

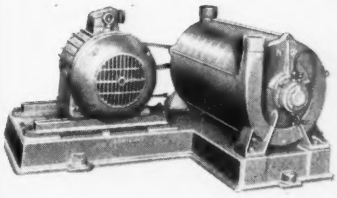
No. 5



No. 6x DUSTBIN TYPE FILTER



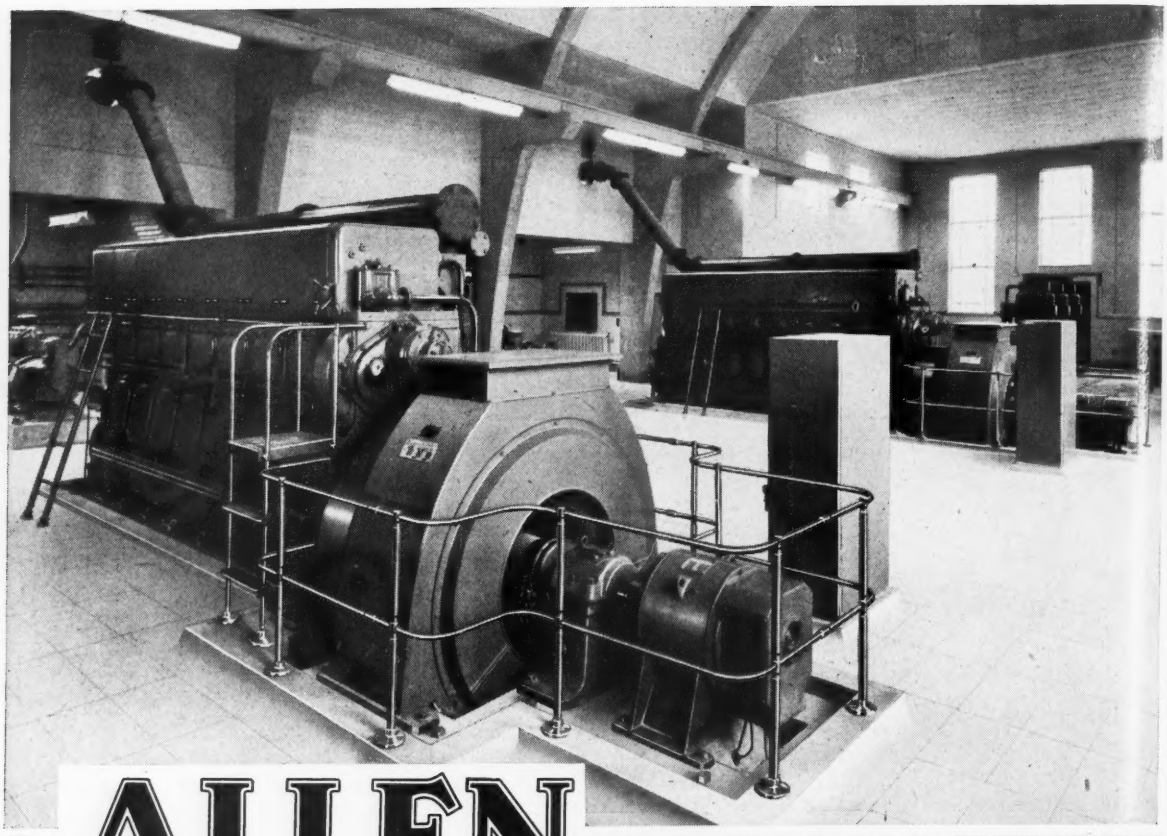
No. 6x WITH FILTER RECEIVER



No. 8-14x FIXED PLANTS

These robust long-running machines stand up to the most arduous conditions to clean floors, walls, beams, ledges, pipes, machinery, storage rooms, boiler flues, and meet a host of other everyday applications in the light and heavy industries. Detailed care in design and manufacture of every component — cleaning tools, suction hose, connectors, filters, turbo exhausters, motors and switchgear — establishes the superiority of Sturtevant Vacuum Cleaners which is acknowledged by universal use in almost every industry at home and abroad. Details of cleaning problems are invited, and we shall be happy to send you a copy of our leaflet U.5007 which illustrates many applications of Sturtevant Vacuum Cleaners.

STURTEVANT ENGINEERING CO. LTD.
SOUTHERN HOUSE, CANNON STREET, LONDON, E.C.4



ALLEN

DIESEL GENERATING PLANT

for Water Pumping Station's

. . . electricity supply . . .

Illustrated above are two diesel engine-driven alternator sets in service at the Hardham Pumping Station of the North-West Sussex Joint Water Board. The engines are 8-cylinder Allen standard four-stroke units (type S37-C), running at 428 r.p.m., directly coupled to Allen alternators rated at 424kW, 415/240 volts, 3-phase, 50-cycles.

The fuel-oil, starting-air, cooling-water and exhaust systems are typical for this type of installation, careful consideration having been given to the question of reliability over long periods of continuous running, with adequate standby facilities. Each set is capable of supplying the present electrical load requirements of the pumping station, with the second unit acting as standby.

Consulting Engineers: Messrs. Edward Sandeman, Kennard & Partners

---

The range of Allen four-stroke and two-stroke engines and complete engine-driven generating sets, A.C. or D.C., for industry and essential services, covers power outputs from 110 b.h.p. to 1080 b.h.p. (75 to 750 kW).

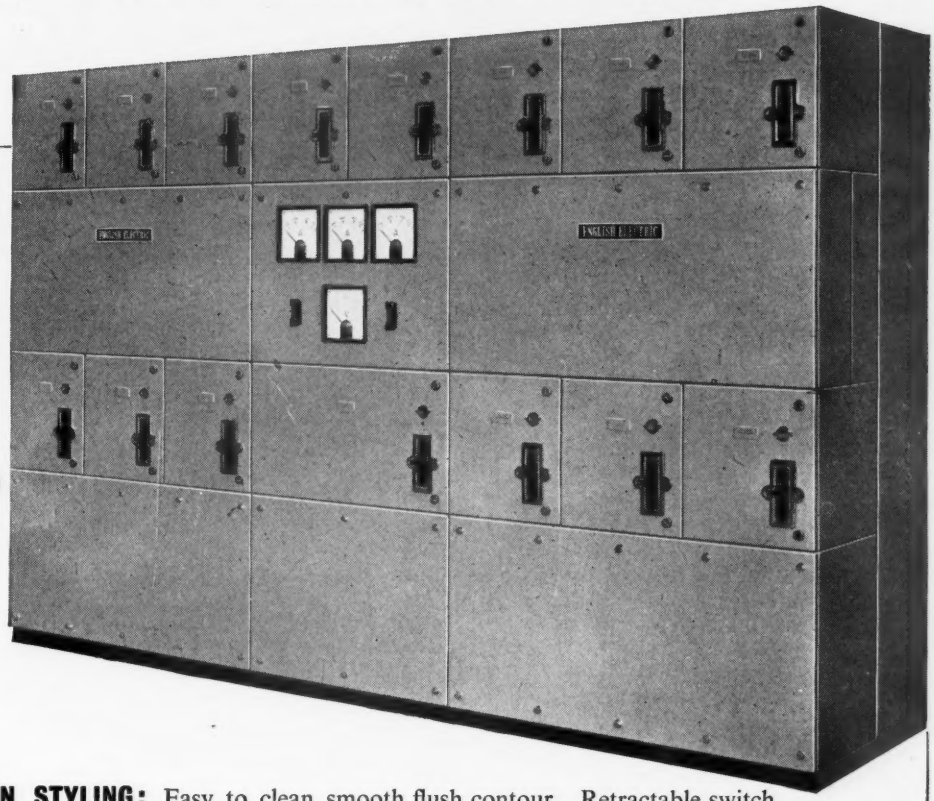
Specialists in complete power generating plant and pumping plant installations

W. H. ALLEN, SONS & Co LTD

BEDFORD **ENGLAND**

'Superform' fuse switchboards

for the control of MEDIUM VOLTAGE circuits



Incorporating H.R.C. CHASSIS TYPE FUSE-SWITCHES in ratings up to 750 amps.

MODERN STYLING: Easy to clean smooth flush contour. Retractable switch operating handles.

SAFETY FEATURES: Busbars, connections and terminals fully insulated. Potential circuits fused at supply point. Integral cylinder locks fitted to fuse-switches.

PERFORMANCE: Fuse-switches proved for making capacity on 50 MVA. at 440 volts, 3-phase, 50 cycles.

ACCESSIBILITY: Hinged instrument panels give ready access to instruments, terminal boards and small wiring.

'ENGLISH ELECTRIC'

fusegear

See also our Rectifiers advertisement in this issue

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Fusegear Works, East Lancashire Road, Liverpool, 10

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

F.18G4

"Hailware"

LIGHTING GLASS

For the transmission, direction and diffusion of light there is still no medium to equal the efficiency and durability of Glass. It does not distort, burn, scratch or discolour and does not deteriorate with age. Our Glassworks are devoted exclusively to the production of Lighting Glass of the finest quality and we can really say that we are specialists. Increasing demands for "Hailware" Lighting Glass called for an extensive programme of re-equipment and expansion of our Glassworks. This has been completed and we now have one of the most up-to-date plants specialising in the manufacture of Lighting Glass, thus we are enabled to offer a much improved service to our many customers.

We would emphasise that every type of Lighting Glass we produce is melted in Pots and not in Tanks, in consequence our Glassware has just that extra bit of "quality" about it and gives, too, increased light output, good colour, finish and freedom from blemishes. This, no doubt, is one of the reasons why "Hailware" Lighting Glass is being increasingly specified for Lighting Installations both at home and abroad.

Of the types of Glassware we manufacture, three ply Opal is the one in greatest demand, and we have moulds for producing, in every size, most of the popular shapes now in use. We can also supply these in Coloured Opal or Clear Glass and with applied decoration when required. In addition, we have now in production a useful range of glasses and lenses in various colours for Signal purposes, the colour is actually in the glass and they are available in Ruby, Green, Blue, Amber and White.

We make numerous other types of Lighting Glasses, in short, wherever there is a Light Source that requires shielding or diffusing, whether it be in the home, office, school, factory, ship, coach, switchboard, etc., we can produce the necessary globe, shade or lens. We are always pleased to quote for special requirements, so if you have any Lighting Glass problems, remember we are at your service.

HAILWOOD & ACKROYD LTD. *The Glass Manufacturers*

BEACON WORKS - MORLEY - YORKS Phone: Morley 571-2
and 18 LOWNDES STREET - LONDON - SW1 Phone: Sloane 0471-2

DAMP? HEAT?
COLD? FUMES?
VIBRATION & SHOCK?

BERCO

Hermetically sealed potentiometers are Type Approved to Class H.1. of RCL 121, 2.5 watt rating for use in Arctic and Tropical conditions.

Shaft Length (inches) ...				⅞		1		1⅛	1¼		1⅜		1½	
Part No.				647		648		649	650		651		652	
Ohmic value ...	5	10	25	50	100	250	500	1,000	2,500	5,000	10,000	25,000	50,000	
Current (amps.)	1	.7	.45	.32	.22	.14	.1	.07	.045	.032	.022	.014	.01	

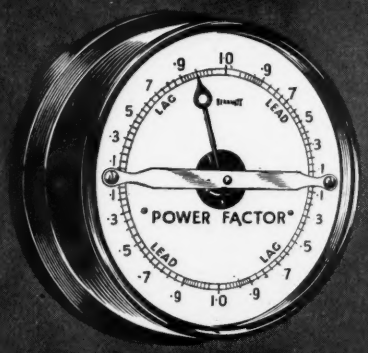
THE BRITISH ELECTRIC RESISTANCE CO. LTD.
Queensway, Ponders End, Middlesex. Telegrams & Cables: VITROHM, ENFIELD. Telephone: HOWARD 1492.

BR 1241-AH

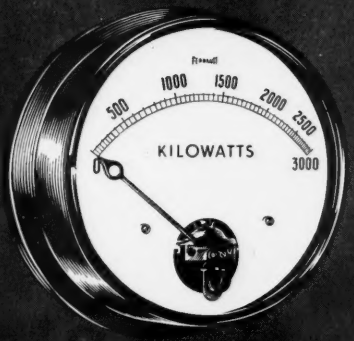
FERRANTI

Switchboard Instruments

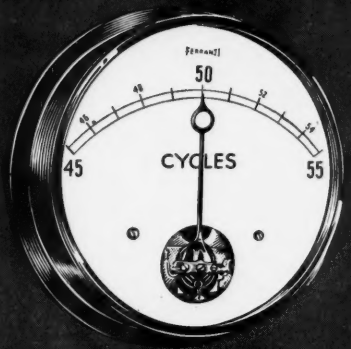
- *New Design*
- *Compact*
- *Good Delivery*



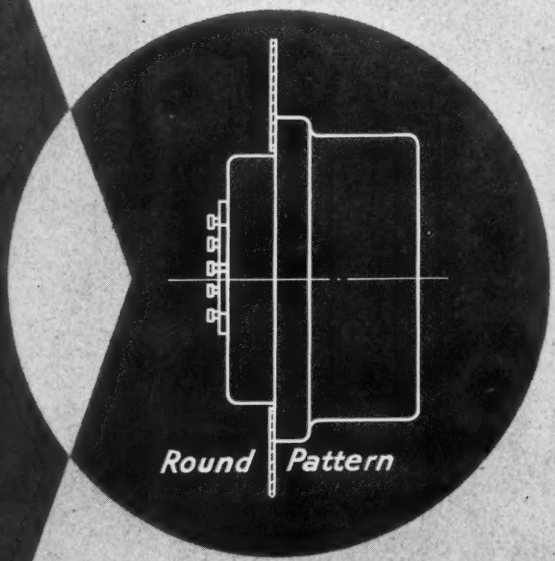
POWER FACTOR METERS



WATTMETERS



FREQUENCY METERS



Here are three instruments from the latest Ferranti range. Shallow pressed steel cases, 4", 6" or 8" round or square dials, semi-projecting or flush mounting. All types of Ferranti switchboard instruments are available in hermetically sealed cases. Full details on request.

FERRANTI

FERRANTI LTD · MOSTON · MANCHESTER 10
Head Office and Works: HOLLINWOOD, LANCS.
London Office: KERN HOUSE, 36, KINGSWAY, W.C.2

rl.132

you can't beat a "Belling"
"Belling" ELECTRIC COOKER
FREE!
Write to Belling & Co. Ltd., Enfield, Middx. for our new 64-page illustrated catalogue of electric fires and cookers, which are obtainable through your usual ELECTRICAL SHOP OR SHOWROOM.
CRC 144
For Warmth and Comfort
. . . when quick, efficient and economical heating is indispensable for comfortable living, there is something to suit every pocket and every taste in the Belling range of electric fires and heaters.
Call and SEE these fires at your Electrical Shop or Showroom.
DINKIE 1 kW size £2.6.6. inc. tax
2 kW size £3.8.4. inc. tax
DAINTY 2 kW size Light Bronze £6.3.0.
2 kW size Electro-Plated Bronze £7.10.4. (Both prices include tax).
HOTSPUR 1 kW size £3.11.9. inc. tax
2 kW size £4.13.0. inc. tax
EMPIRE 1 kW size £2.12.0. inc. tax
2 kW size £4. 7.6. inc. tax
3 kW size £5.14.10. inc. tax
you can't beat a "Belling"
FREE
Write to Belling & Co. Ltd., Enfield, Middx., for their new 64-page coloured book which gives a whole lot of very useful information (including running costs, etc.) on the use of electricity for heating and cooking in your home.
CRC 148

These are the Belling advertisements now appearing in national, provincial and local newspapers. They're the kind of advertisements which, as you probably know from past experience, create interest and above all bring people into your shop or showroom to see things for themselves.

you can't beat a "Belling"

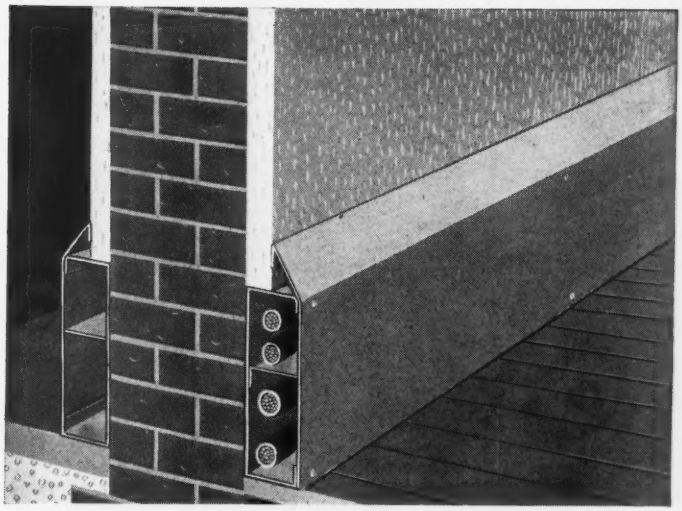
BELLING & COMPANY LIMITED · BRIDGE WORKS · ENFIELD · MIDDX. · TELEPHONE: HOWARD 1212
CRC 419

BRABY Cable Trunking

Easy to fix

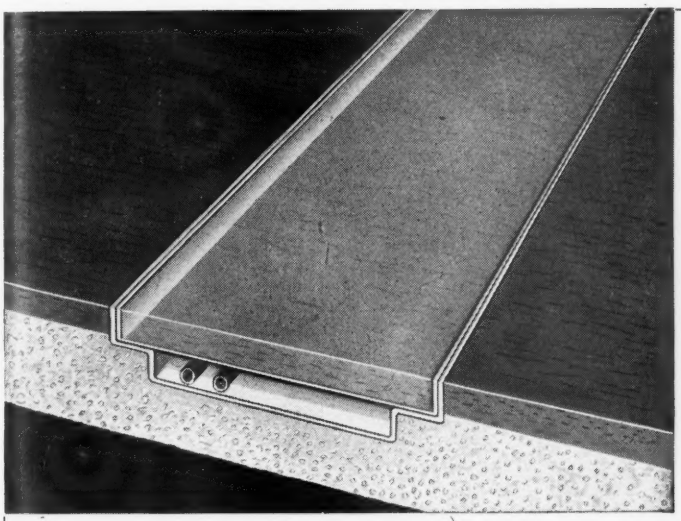
Easy to adapt

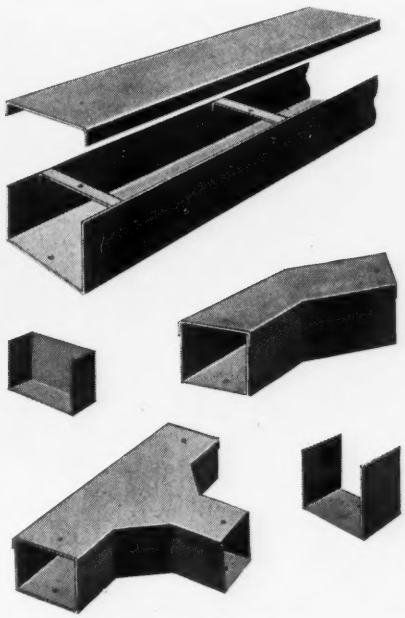
Easy to inspect



Braby conduits and accessories in 16g. zinc-coated mild steel, stove enamelled throughout, form the most efficient means of carrying multiple cable runs. Neat and unobtrusive, they are particularly suited to wiring installations that may need frequent alteration. Widely used in factories, hospitals, cinemas and offices.

A leaflet will be forwarded on request.





Cable trunking conduits and accessories are produced in a wide range of sizes and units which permit any type of junction or bend to be constructed. Special sections and fittings can be made to specification.

ONE OF THE WIDE RANGE OF

BRABY

PRODUCTS

FREDERICK BRABY & COMPANY LIMITED

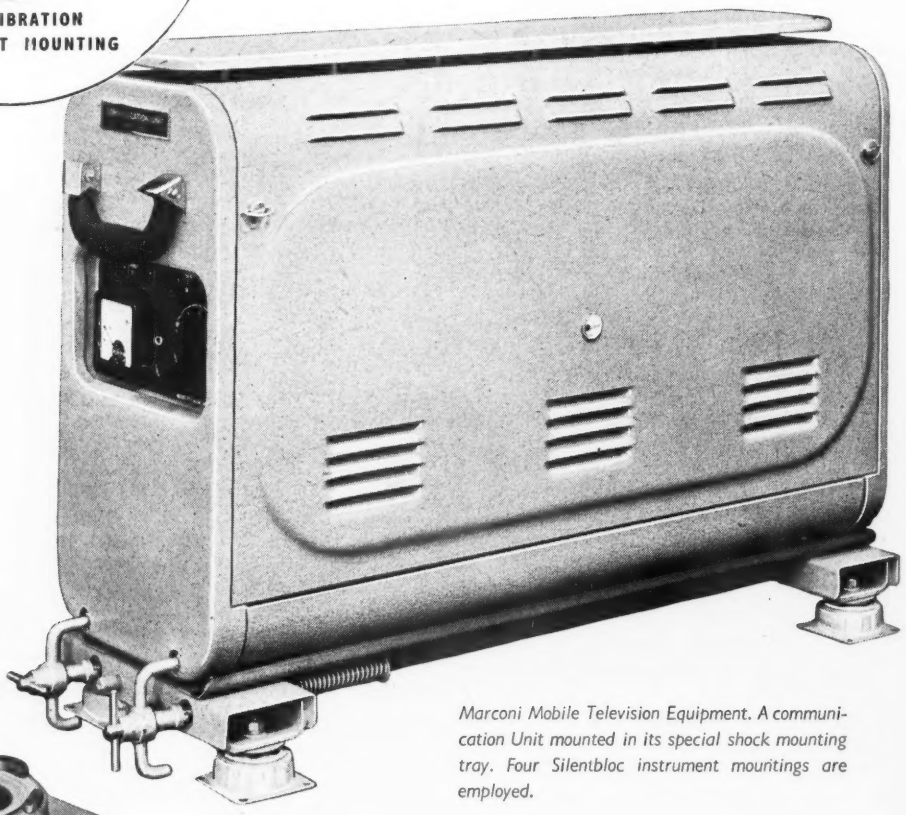
LONDON WORKS, THAMES ROAD, CRAYFORD, KENT. TELEPHONE: BEXLEYHEATH 7777

OTHER FACTORIES AT: Ida Works, Deptford, London, S.E.8. TELEPHONE: TIDeway 1234
Havelock Works, Aintree, Liverpool, 10. TELEPHONE: Aintree 1721
Eclipse Works, Petershill Road, Glasgow, N. TELEPHONE: Springburn 5151
Ashton Gate Works, Bristol, 3. TELEPHONE: Bristol 64041. Also Falkirk and Motherwell

OTHER OFFICES: 352-364 Euston Road, London, N.W.1 (Head Office). TELEPHONE: EUSton 3456
110 Cannon Street, London, E.C.4 (Export). TELEPHONE: MANsion House 6034
Queen's Buildings, 10 Royal Avenue, Belfast. TELEPHONE: 26509
Palace Street, Plymouth. TELEPHONE: 2261

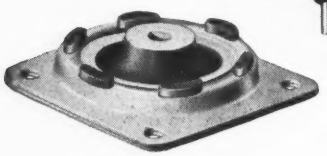
266/55

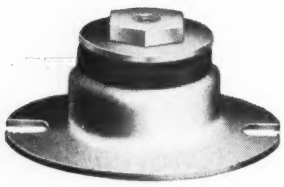
designed to defeat VIBRATION



Marconi Mobile Television Equipment. A communication Unit mounted in its special shock mounting tray. Four Silentbloc instrument mountings are employed.

Silentbloc Instrument Mountings. Full particulars on application.





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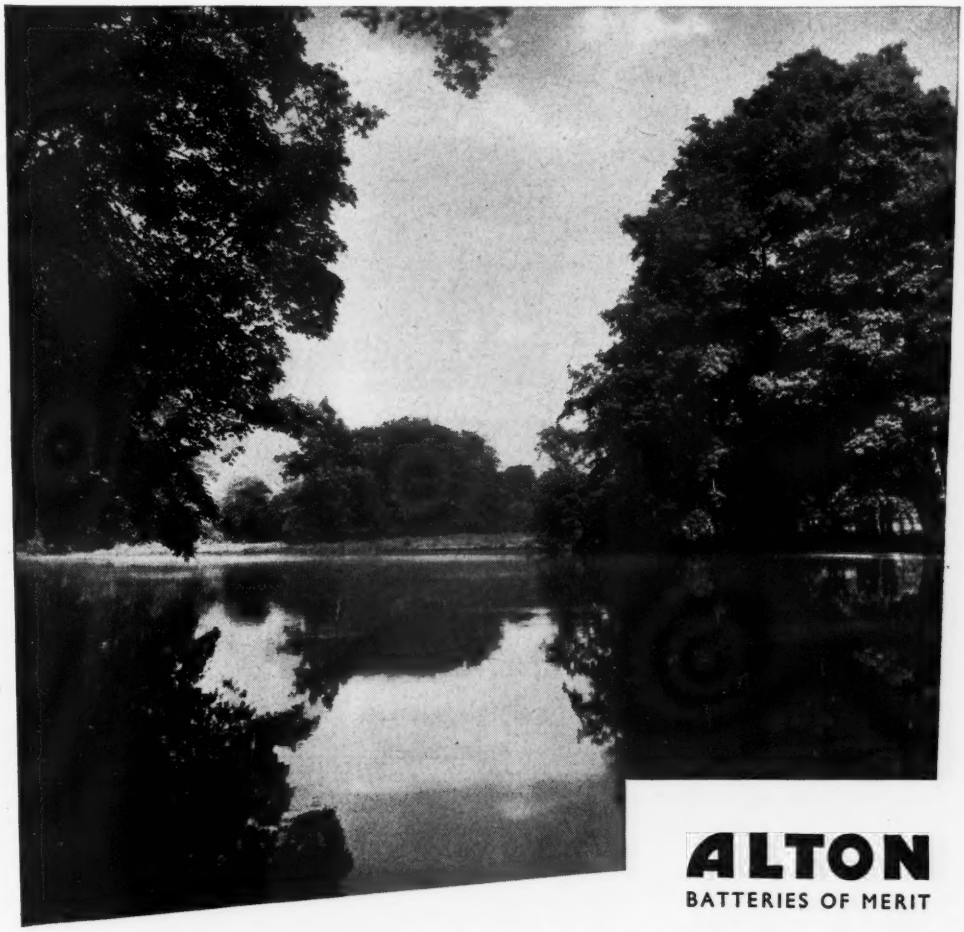

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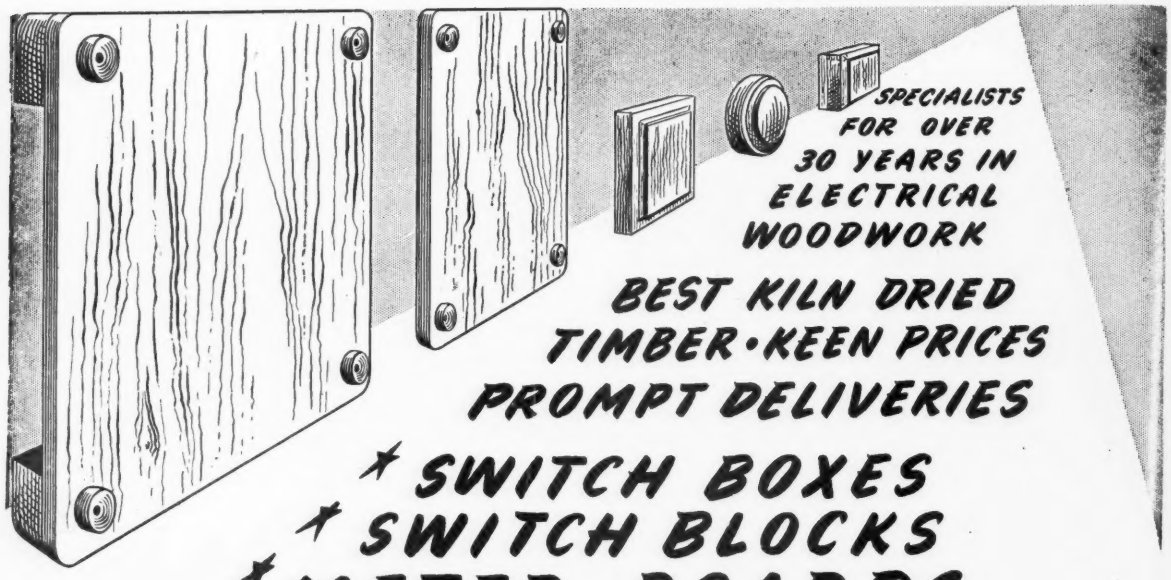

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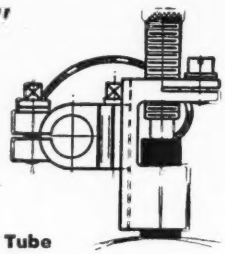

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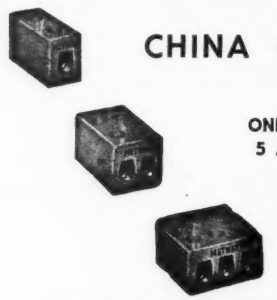

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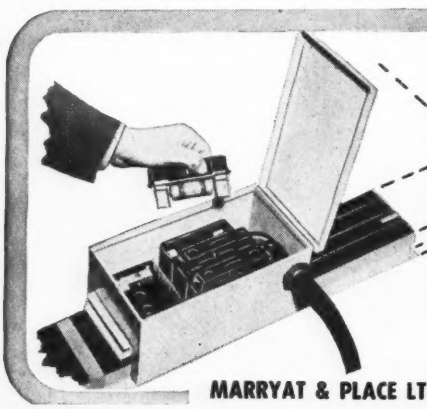

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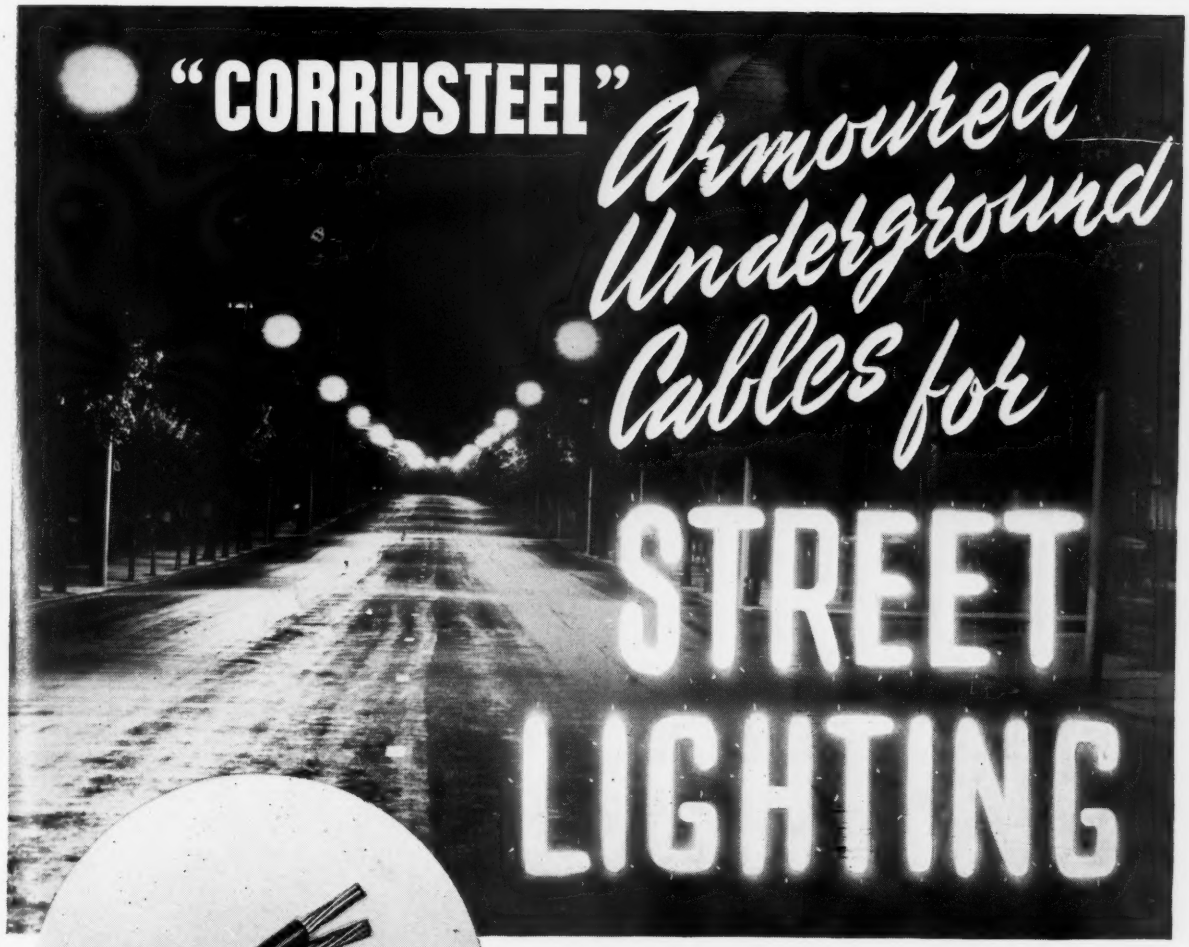

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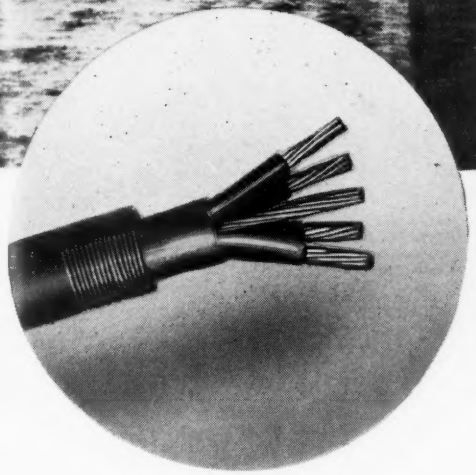

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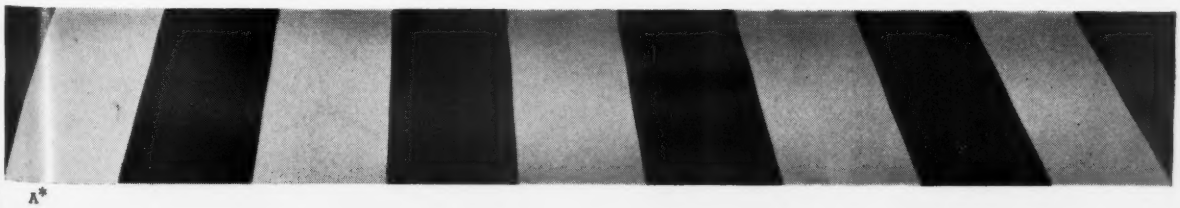

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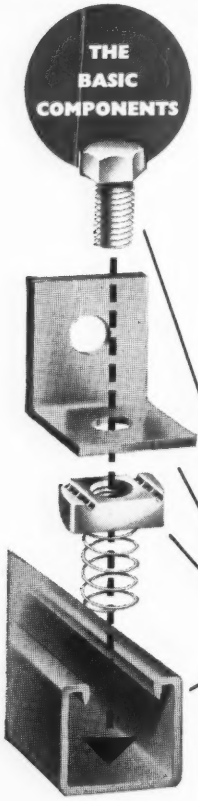

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$\frac{1}{2}$" and $\frac{1}{4}$" sizes.

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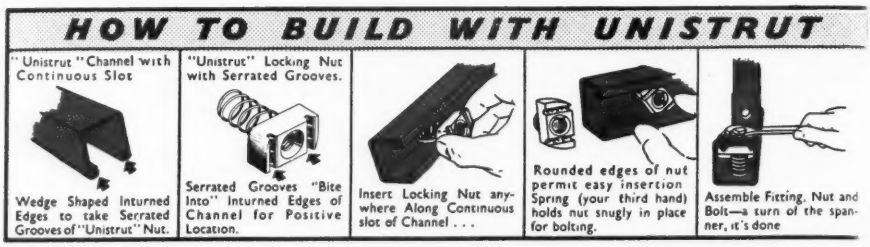
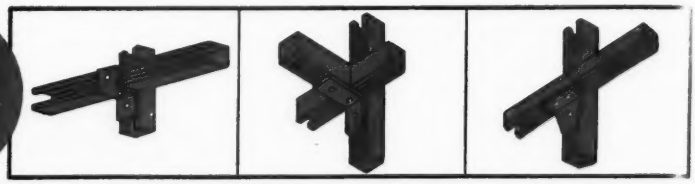
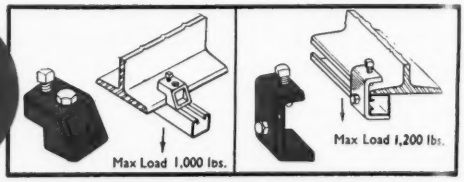

"Unistrut" Channel with Continuous Slot
Wedge Shaped Inturned Edges to take Serrated Grooves of "Unistrut" Nut.
"Unistrut" Locking Nut with Serrated Grooves.
Serrated Grooves "Bite Into" Inturned Edges of Channel for Positive Location.
Insert Locking Nut anywhere Along Continuous slot of Channel . . .
Rounded edges of nut permit easy insertion Spring (your third hand) holds nut snugly in place for bolting.
Assemble Fitting, Nut and Bolt—a turn of the spanner, it's done

FRAMING FITTINGS



BEAM CLAMPS



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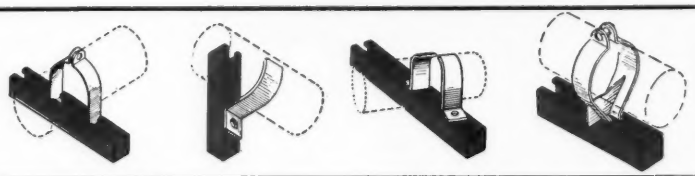
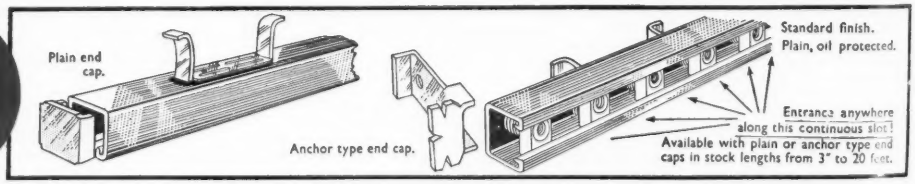
CABLE PIPE AND CONDUIT CLAMPS

There is a UNISTRUT Clamp for $\frac{3}{4}$" to 8" (O.D. or nominal).



CONCRETE INSERTS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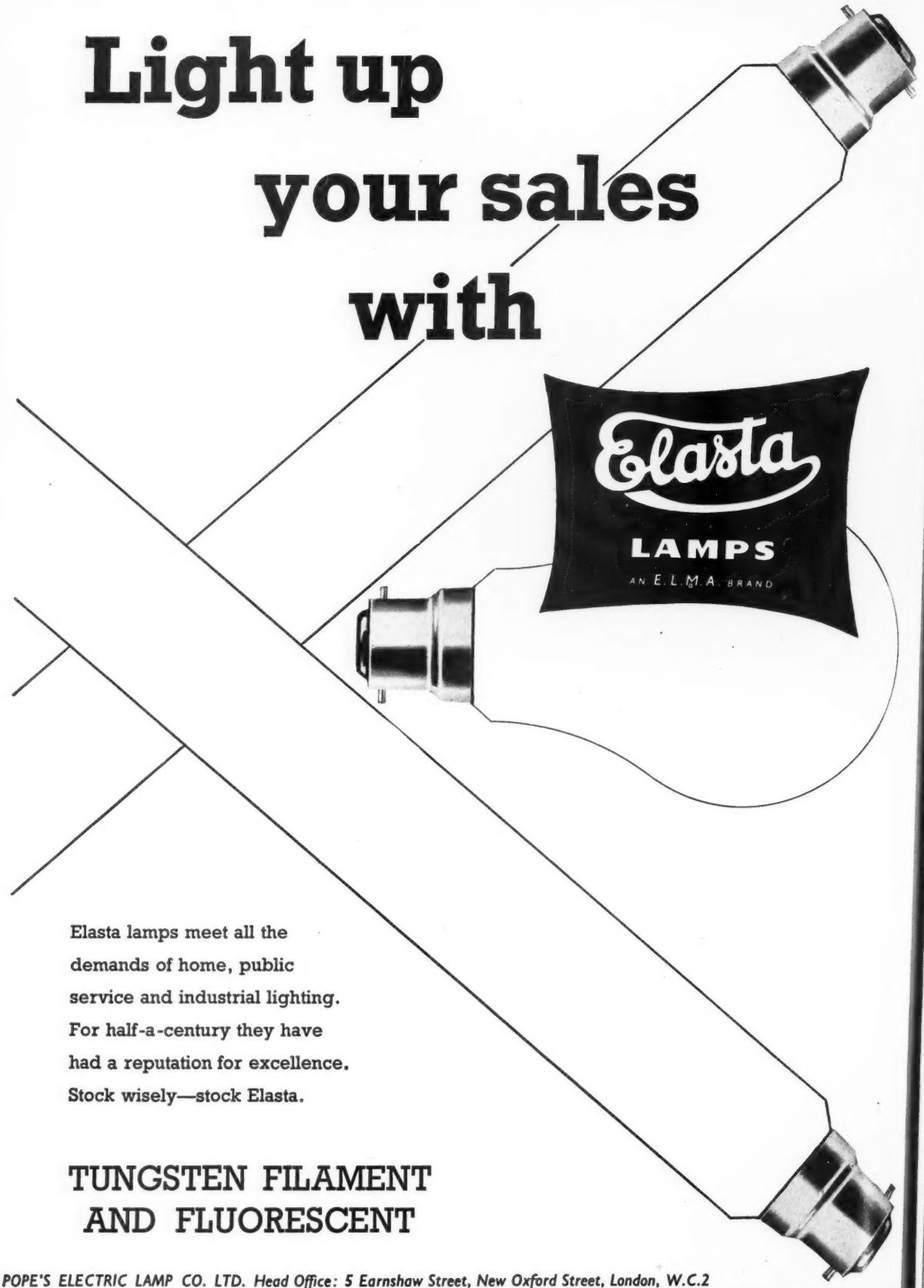

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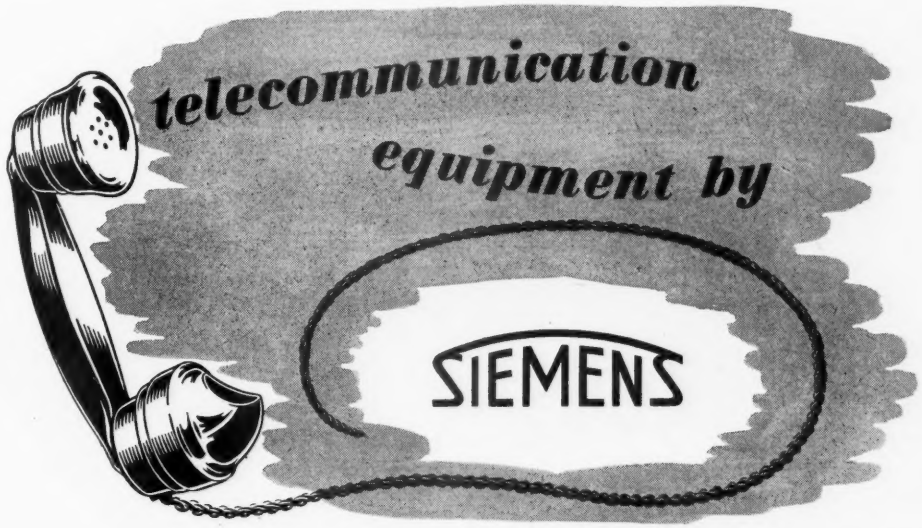

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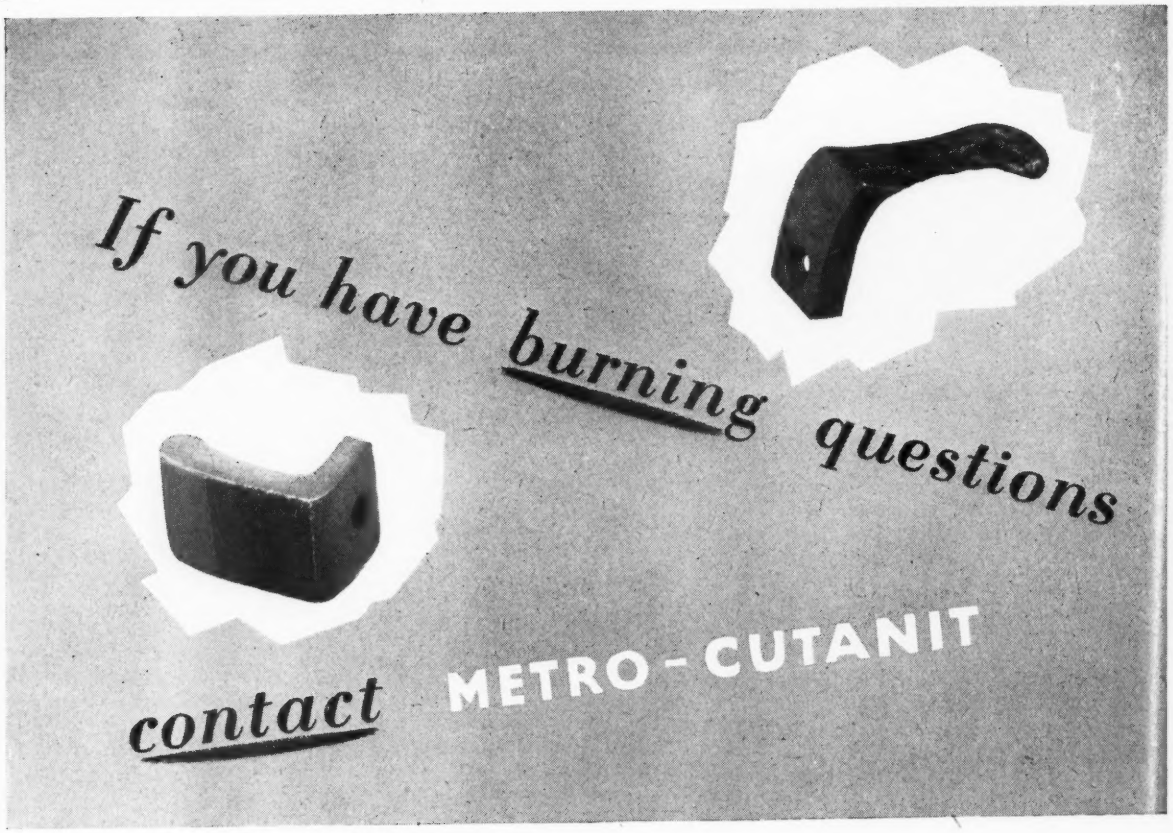

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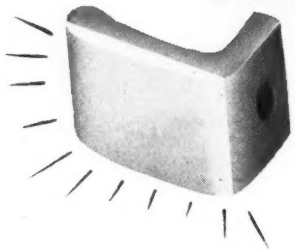

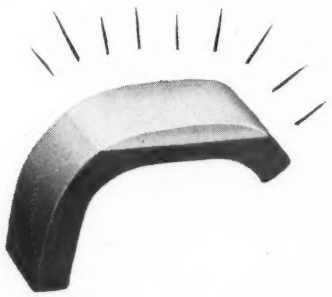

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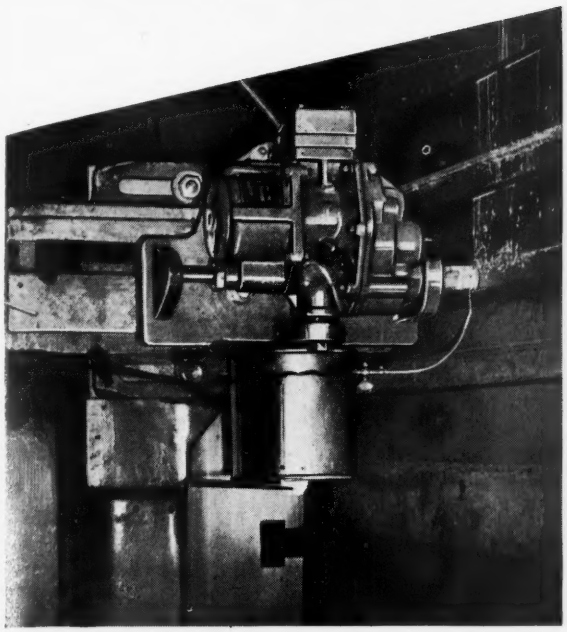

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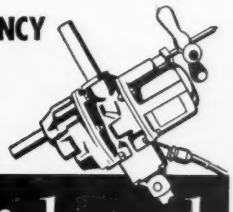

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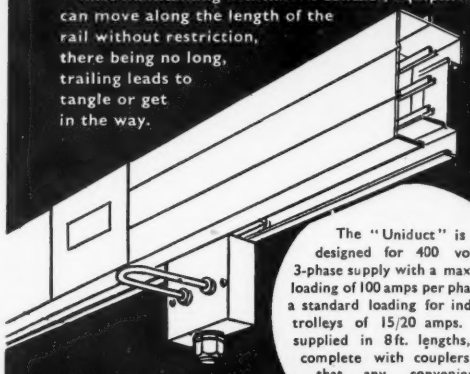

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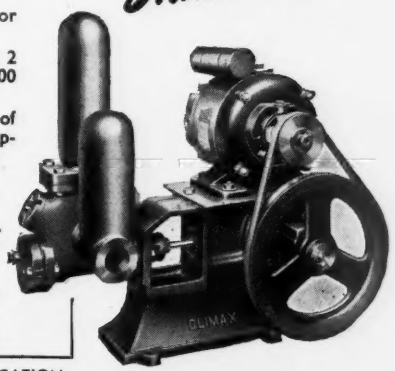

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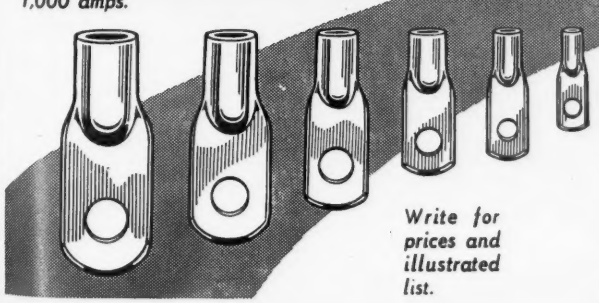

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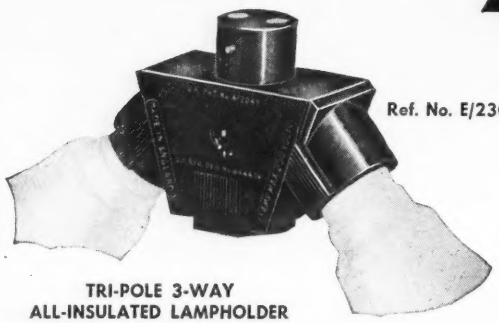

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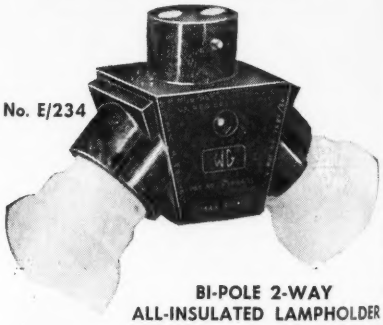

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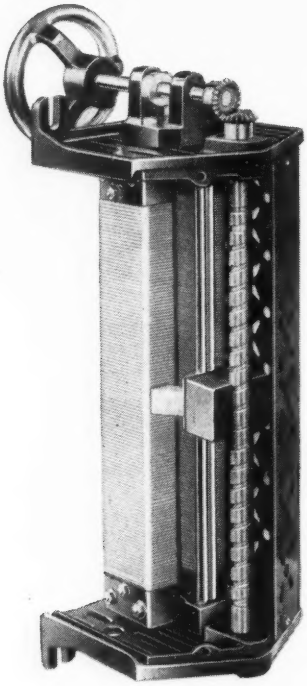

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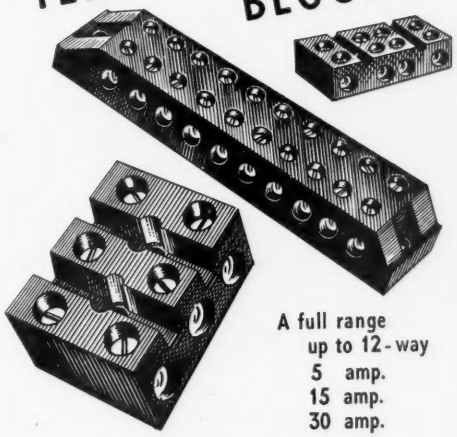

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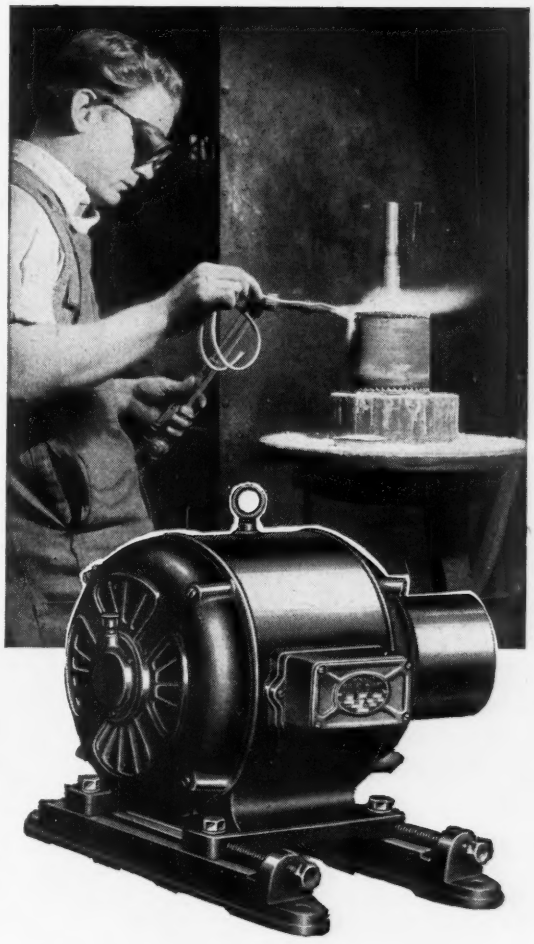

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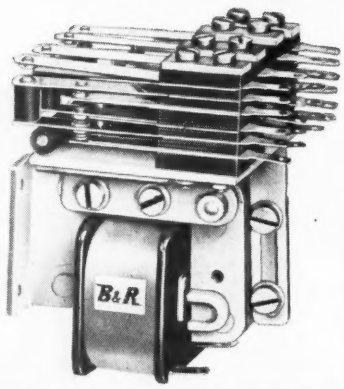

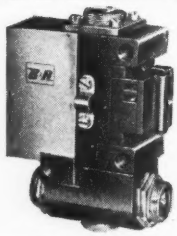

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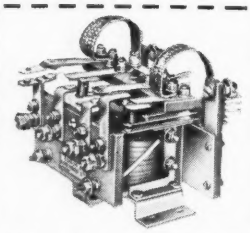

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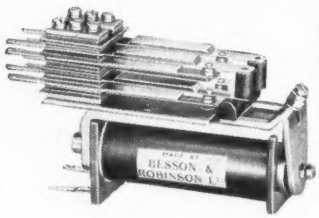

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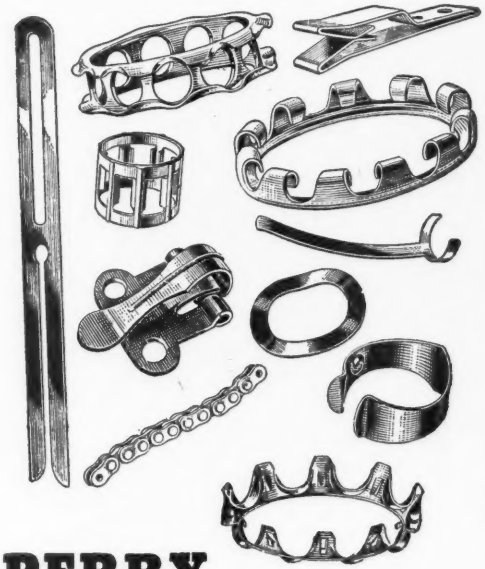

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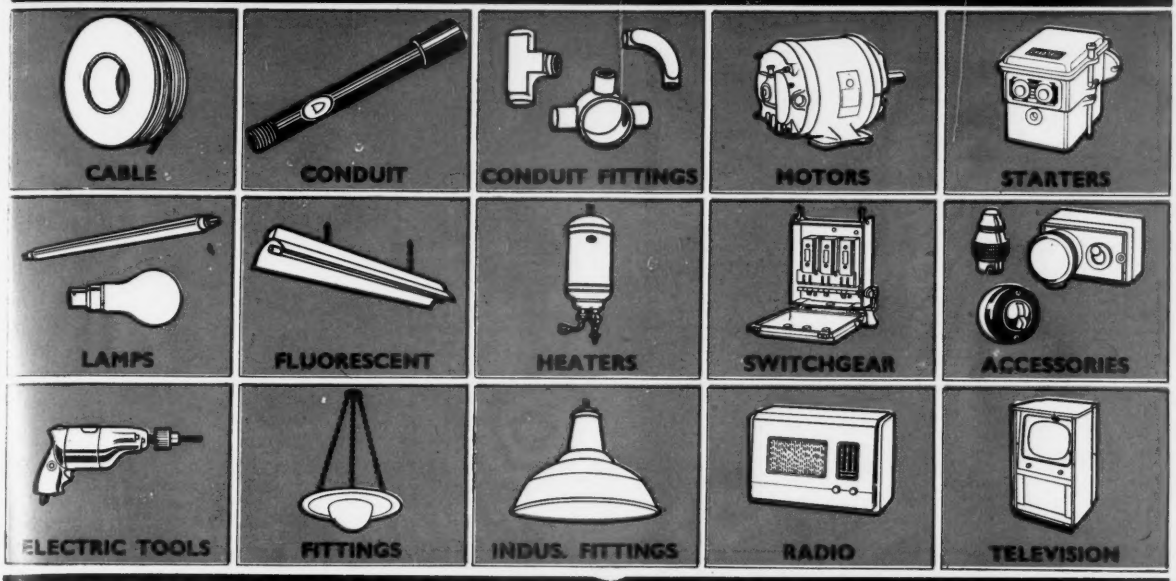

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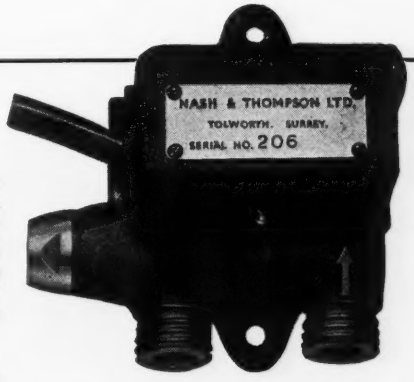

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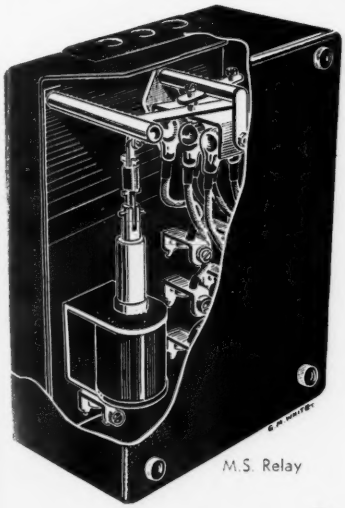

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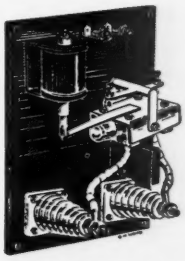

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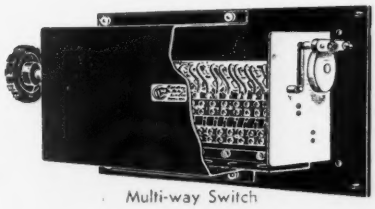

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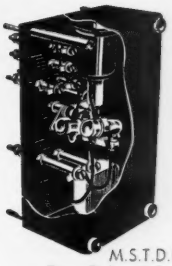

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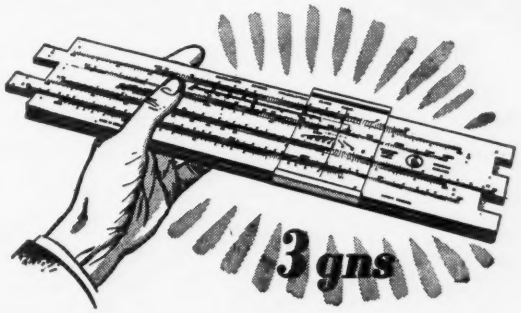

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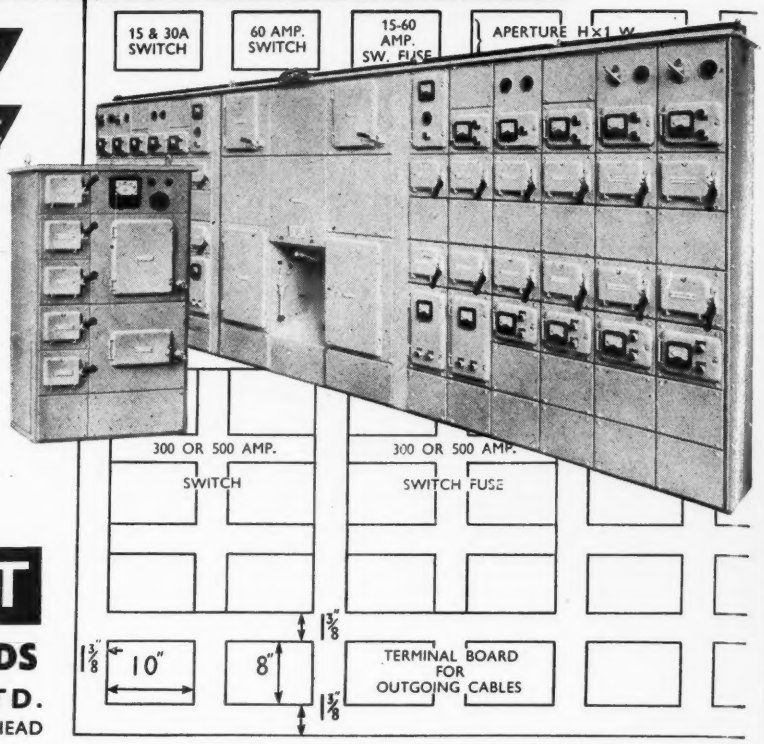

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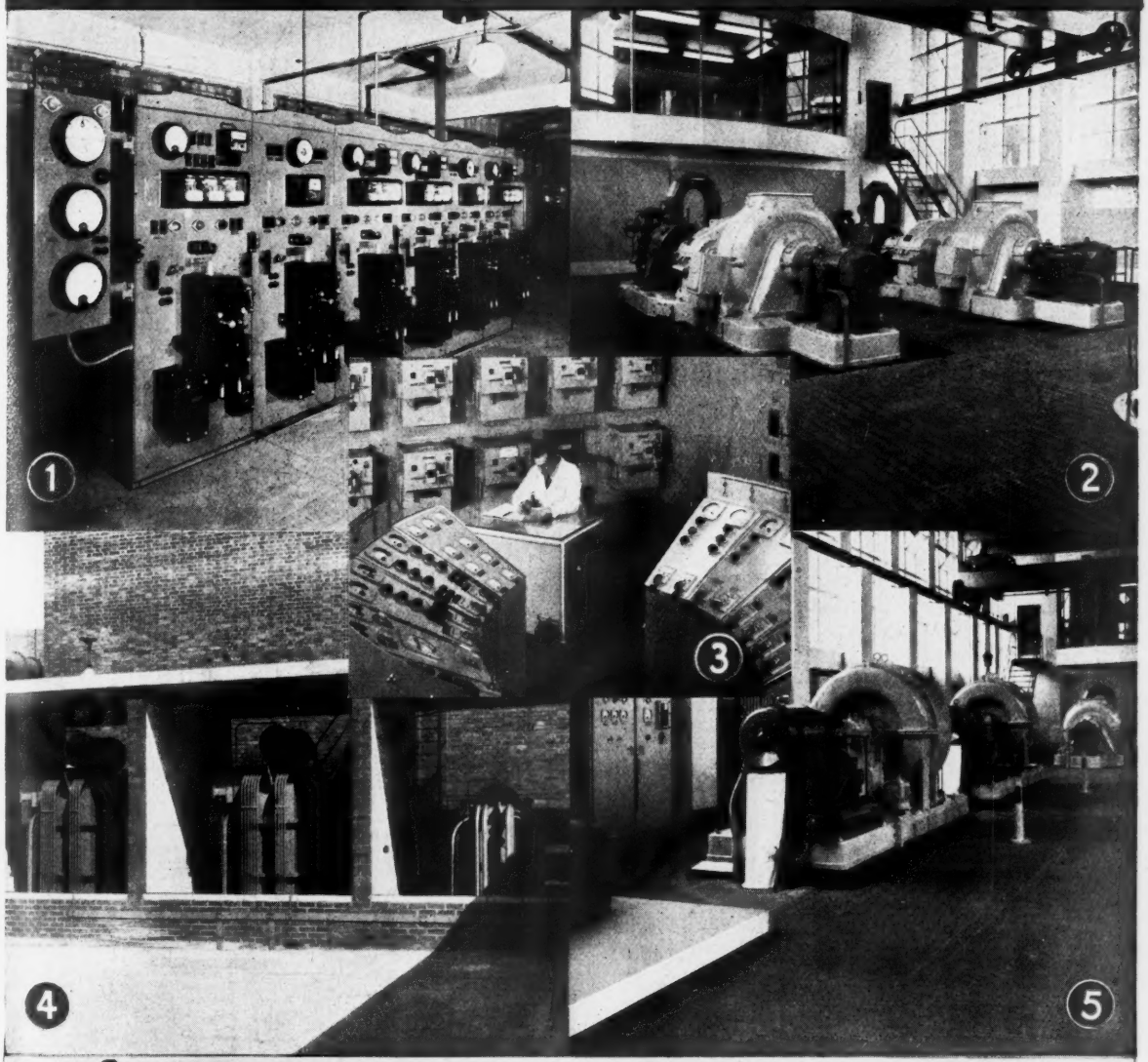

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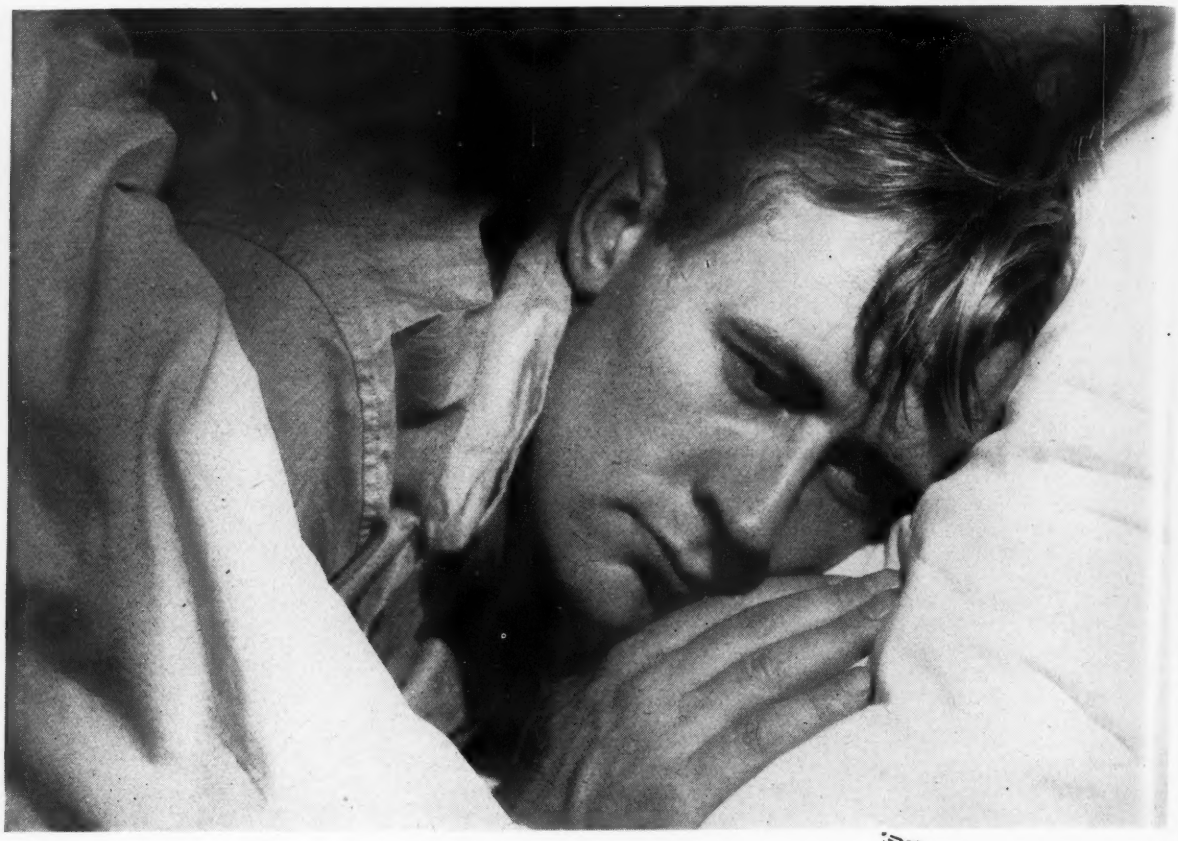

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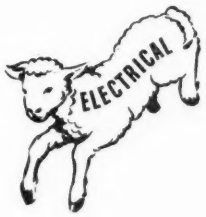

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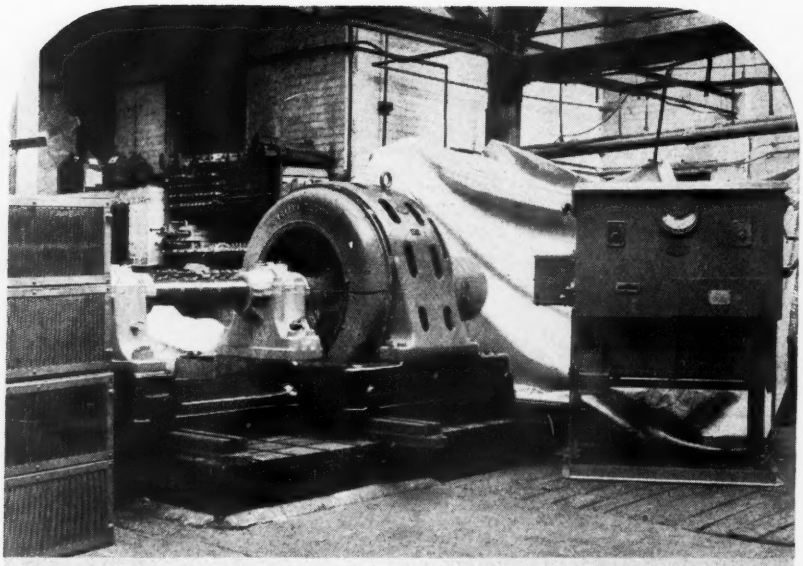

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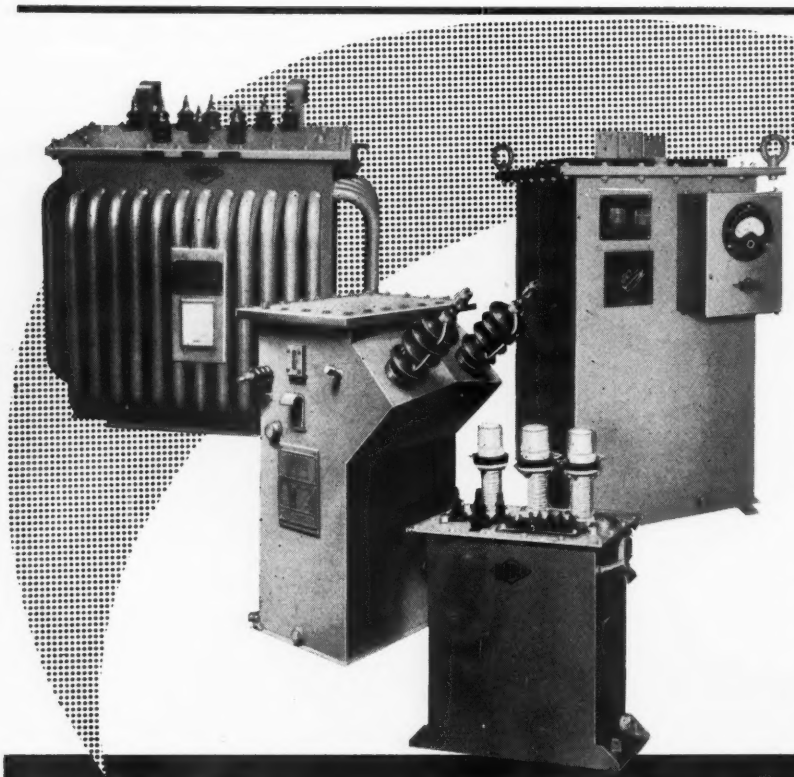

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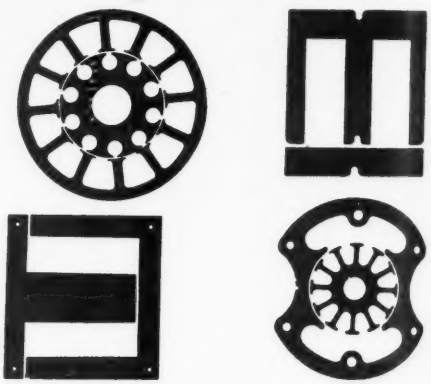

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Fig. 8 section flexibles in P.V.C., or rubber insulation

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V.I.R. or P.V.C. lead in wires or connecting wires

Twin twisted P.V.C. flexible cords

Metal braided flexible cords

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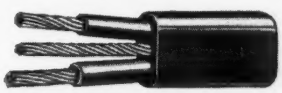
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120 MVA TRANSFORMERS

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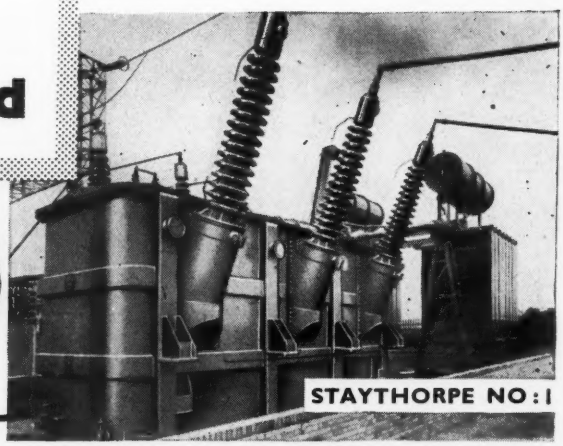
IN SERVICE

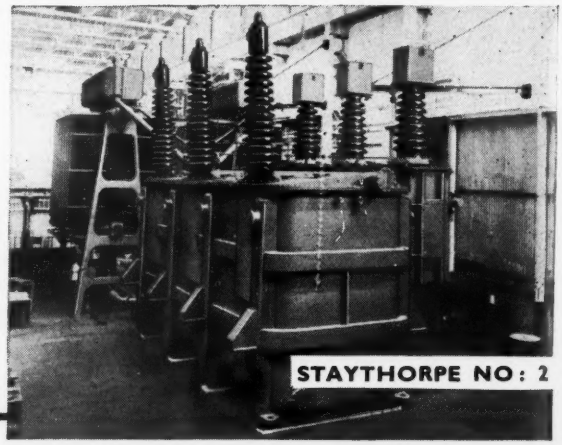


STAYTHORPE NO: 1

READY FOR SERVICE

This transformer is now on site, having passed satisfactorily all specified tests including :—

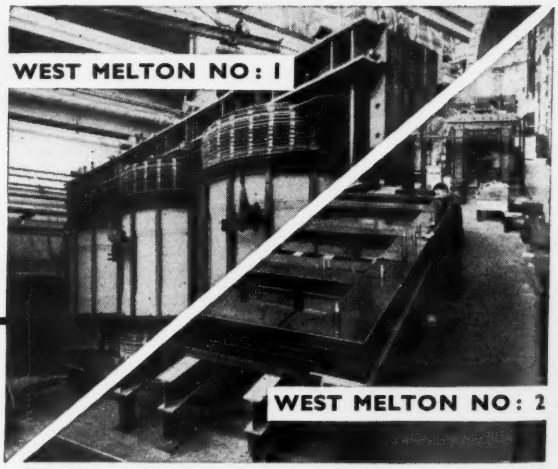
Heat run at full-load losses.
Induced voltage tests at 460 kV to earth and 550 kV between phases.
Impulse tests on 275 kV windings at 1050 kV.
Impulse tests on 132 kV windings at 550 kV.



STAYTHORPE NO: 2

The two transformers for West Melton Substation are now under construction at Rugby. No. 1 has its core and windings assembled, while the core of No. 2 has been laid down.

IN PRODUCTION



WEST MELTON NO: 1

WEST MELTON NO: 2

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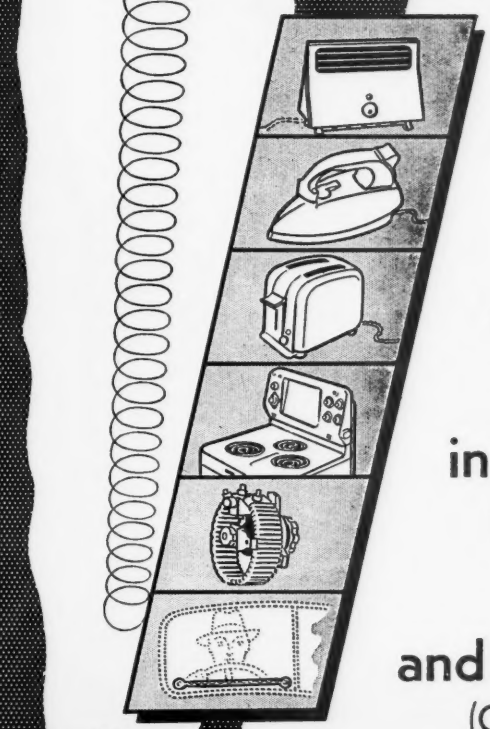

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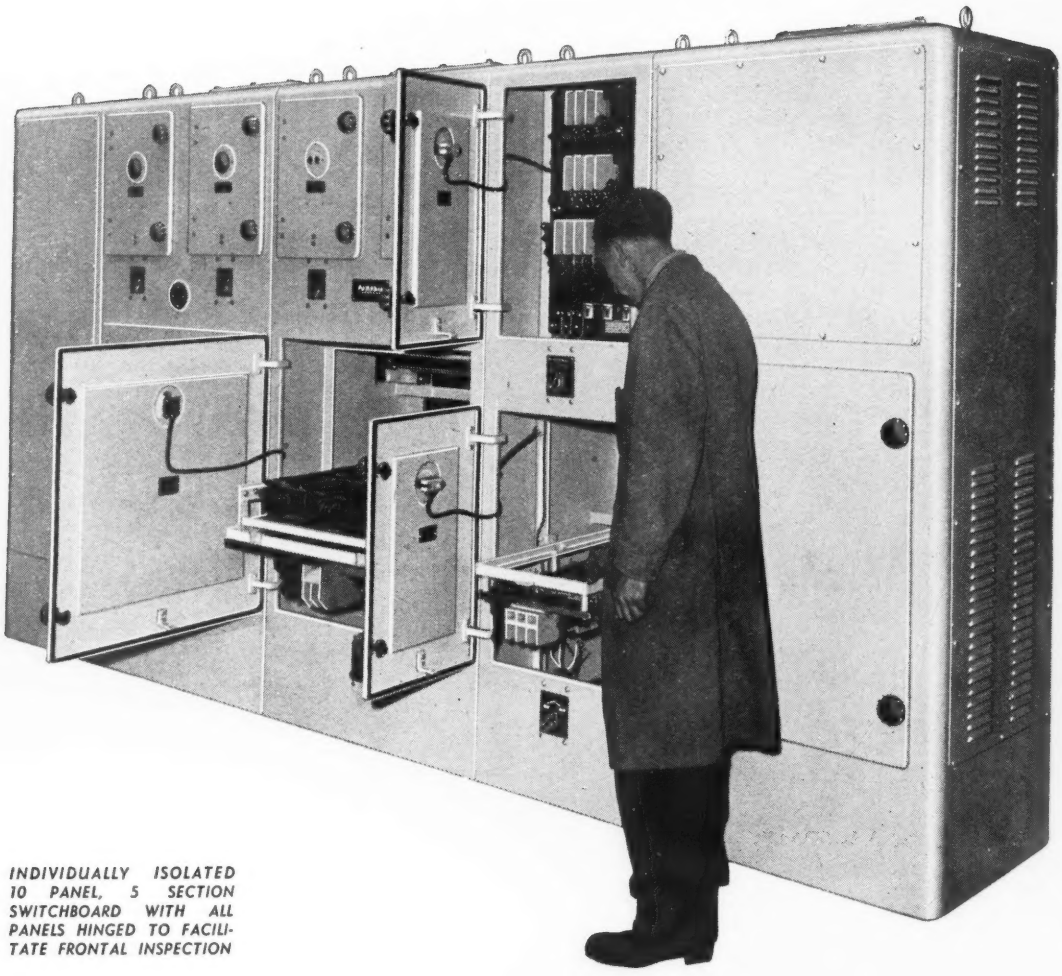

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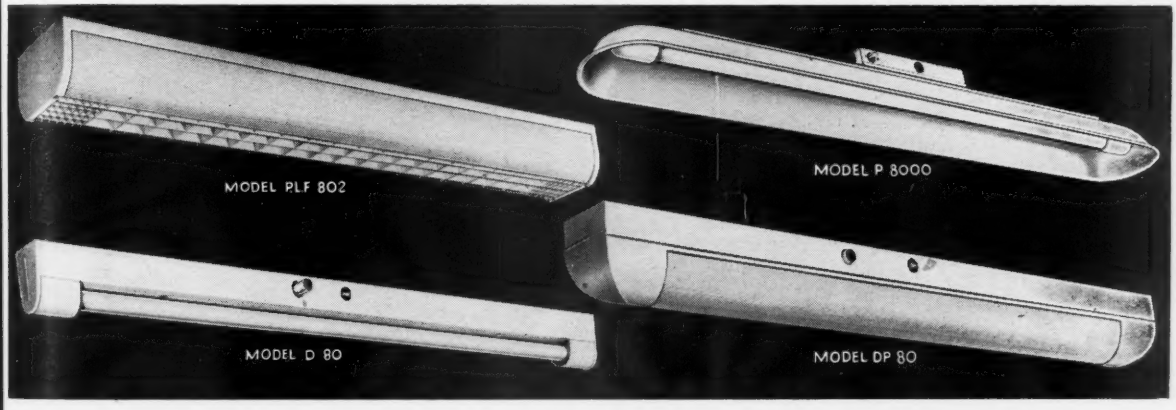

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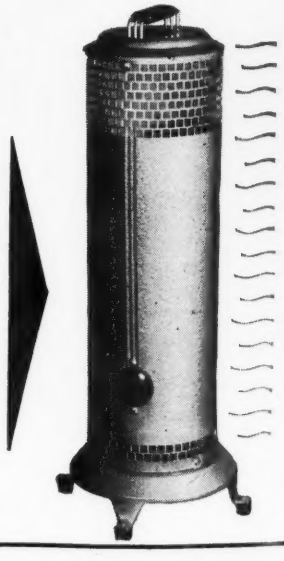
Of distinguished appearance, with neutral coloured body, deep maroon heat-resisting handle and die-cast stand.

THE MOST EFFECTIVE AND ECONOMICAL FORM OF SPACE HEATING IN WINTER OR COOLING IN SUMMER.



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J.&P. ALUMINIUM SHEATHED CABLES

British Patent Numbers 627815 and 627793

are being installed in

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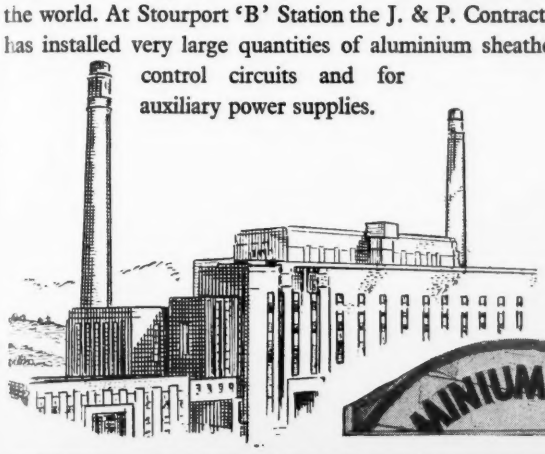
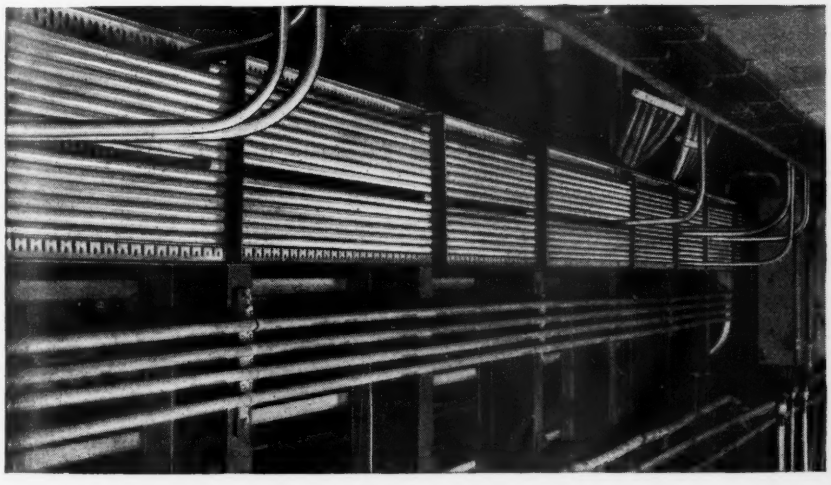
STOURPORT 'B' **CARMARTHEN BAY** **KEADBY & USKMOUTH**

It was less than seven years ago that the world's first aluminium sheathed power cables were produced on a commercial basis—pioneered and perfected by Johnson and Phillips Limited. During this short space of time, J. & P. have supplied thousands of miles of this modern cable to power stations and industrial users of cable all over the world. At Stourport 'B' Station the J. & P. Contract Department has installed very large quantities of aluminium sheathed cables for control circuits and for auxiliary power supplies.

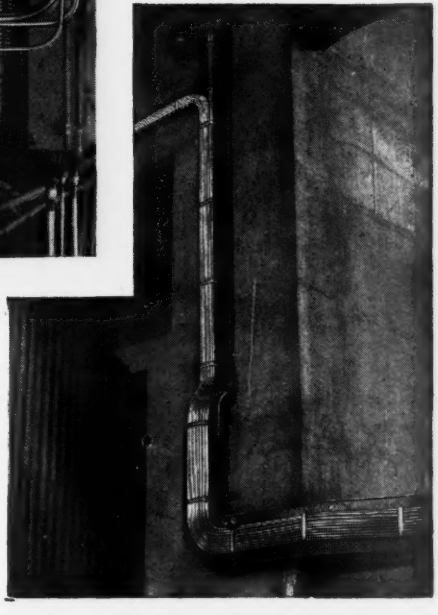


Photographs taken at Stourport 'B' Generating Station.

Consultants:
Messrs. Ewbank & Partners Ltd.



Above: A double bank of thirty J. & P. multi-core rubber insulated aluminium sheathed control cables.



Right: The ease of erection is well illustrated by this run of control cables mounted on perforated trays.

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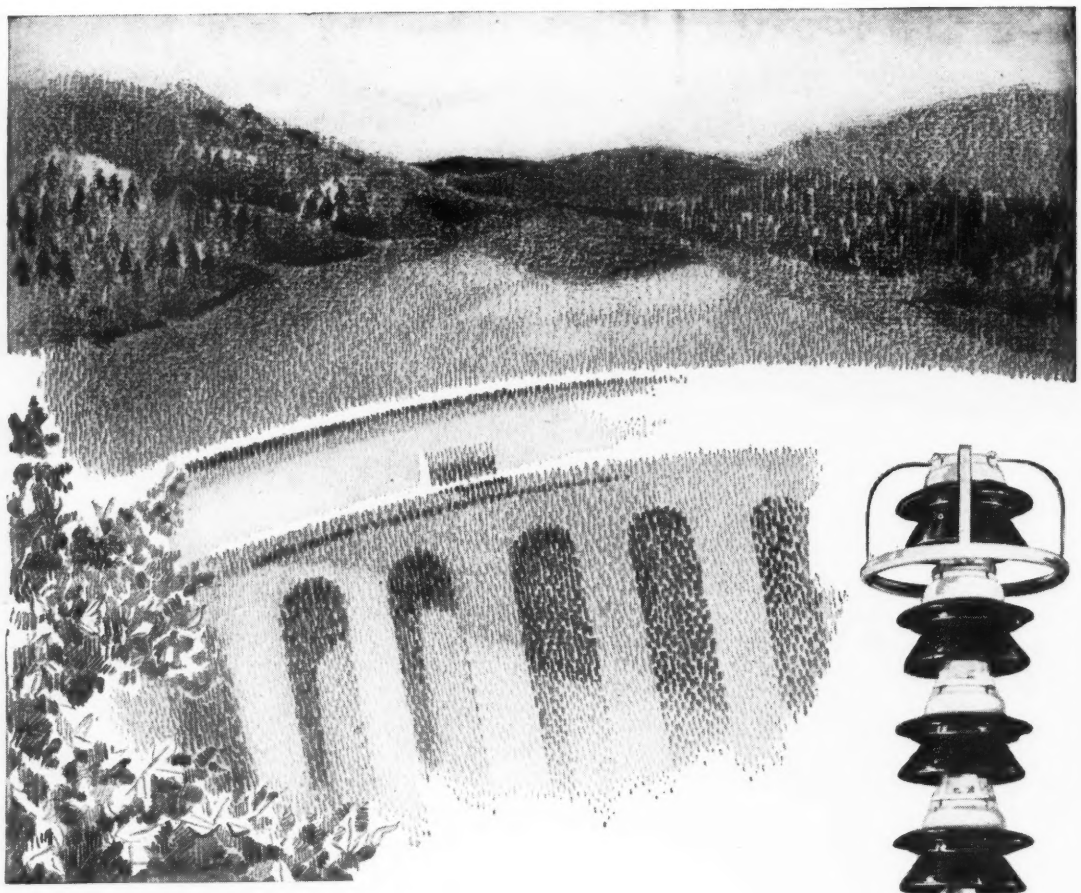
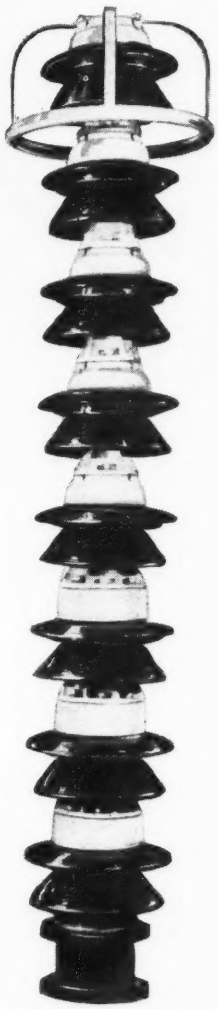
ELECTRICAL ENGINEERS AND CABLE MAKERS

★ *FIRST IN THE WORLD WITH ALUMINIUM SHEATHED CABLES*





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LONDON ENGINEERS
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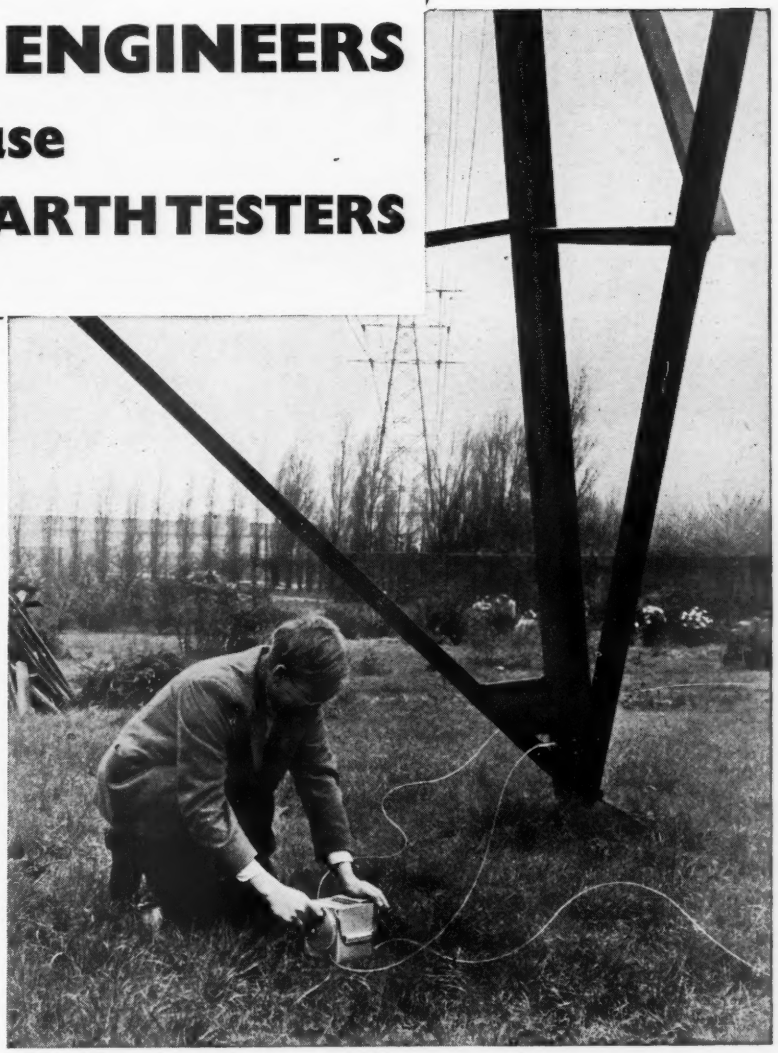

A B.E.A. engineer using a "Megger" Earth Tester, Series 2, to test the earthing efficiency of a pylon.

Engineers of the London Division of the British Electricity Authority use "Megger" Earth Testers to test the efficiency of earthing on recently erected metal pylons.

This is only one of the many uses to which they, and engineers and electricians everywhere, put this famous earth tester. For instance, periodical tests are made to ensure that the initial low resistance of the pylon to earth is maintained.

Another use to which the Authority puts the "Megger" Earth Tester is for testing soil resistivity, as a guide to the location of new earth electrodes. In rural areas it is often employed for tests on pole transformers.

Evershed's have issued a handbook on earth testing which is an invaluable guide to the functions and versatility of the "Megger" Earth Tester. The handbook contains full details of how to make earth tests similar to those above, on your own apparatus. Ask for Publication D.247.

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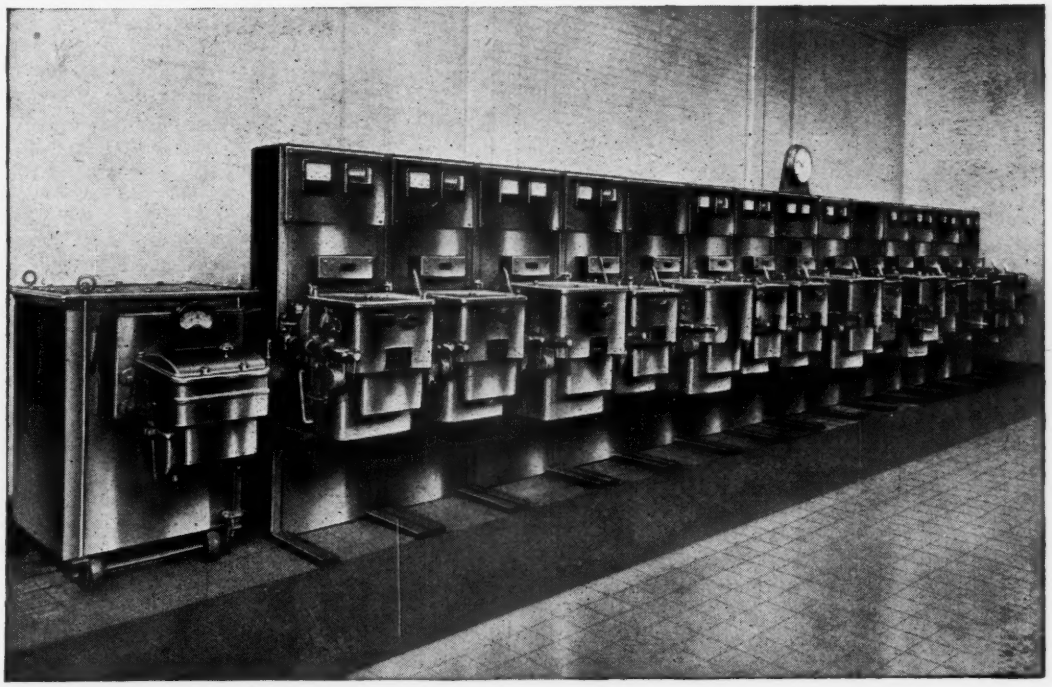
COMPLYING WITH B.S. 116: 1952



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ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.
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8 OCTOBER 1954

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VOLUME 155 ✧ NUMBER 15

Eighty-Second Year of Publication

FRIDAY ✧ ONE SHILLING

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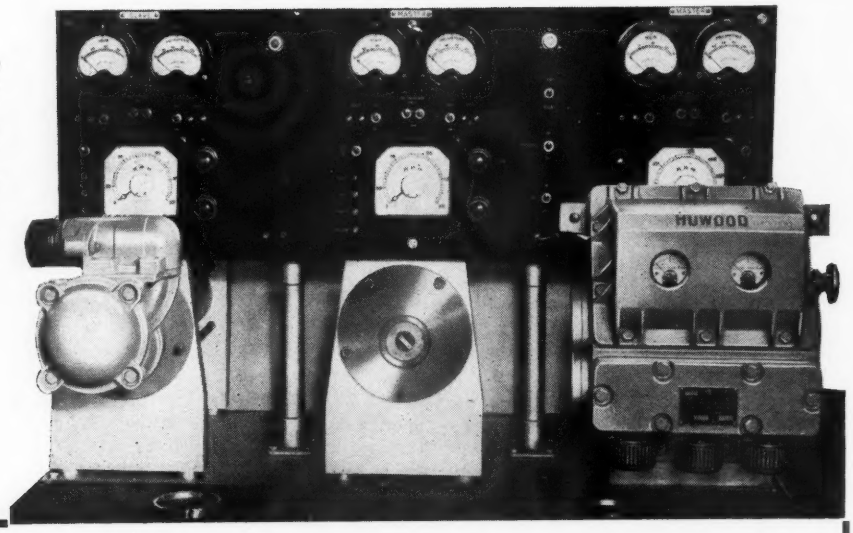
Spearhead to the Coal Drive



EVERETT EDGCUMBE INSTRUMENTS IN SERVICE

The above illustration shows automatic conveyor sequencing and belt protective equipment on test at the works of Messrs. Hugh Wood & Co. Ltd., Gateshead 11.

Speeds are measured by a small generator driven from the conveyor belt. The speed range covered is 150/450 ft./min. approx.

The voltmeters and ammeters at the top indicate the outputs of the generators under test, whilst the three speed indicators below are operated from tachometers coupled to variable speed A.C. motors.

Everett Edgcumbe 'DWARF' indicating and contact instruments are used on the Control Panel also shown on test on the same equipment.

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Sizes: From 2″ to 10″ round or square.

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ELECTRICAL REVIEW

8 October 1954 Vol. 155 No. 15 Established 1872

Learning from America

MAINLY because of the extremely wide terms of reference (" To investigate the dynamic and aggressive American approach to improvement of methods of manufacture and to continuous reduction of operating costs ") given to a British productivity team which visited America, the team's report, " Industrial Engineering " (see *Electrical Review*, 17th September), the last of the series of Productivity Reports to be published, is rather disappointing, certainly to the electrical mind.

For many years three outstanding electrical aspects of American life and productivity have been strongly stressed by the exponents of electricity service and usage in this country. These are: the very much greater consumption of electricity per head of population in America than in this and other countries; the far greater advance which has been made in the materials handling field in America; and the much larger number of graduates per head of population who enter the field of technology, particularly electrical technology. In terms of " industrial engineering " we think that these three issues are of predominating importance and that this importance should have been stressed over and over again in a report in an investigation of this kind.

A weakness of the report lies in the statement that: " We ourselves hesitate to make a diagnosis, and we find ourselves falling back on those clichés of visitors to the U.S.A.: the atmosphere of industrial life; the competitiveness of industry; the lack of rigid stratification in society; the high status of business and industry. . . ."

With the terms of reference laid down there should have been no hesitation; rather should there have been a " dynamic and aggressive " investigation into the outlook of a great nation, which would have demanded a historical research to find the answer which could hardly be expressed in the terms employed in " Industrial Engineering " with its numerous platitudes and exhortations.

It may be presumptuous of us, since we have not had the opportunities which were no doubt afforded the productivity team, to make the suggestion ; but we feel strongly that if industrial engineering, in the basic sense of engineering for production, had been made the subject of investigation the report would have had a far greater value in showing the American approach to productivity and its influence on production in this country, which would have placed in true perspective the dependence of production on electricity supply and electrical manufacturing.

REDUCING SUPPLY INTERRUPTIONS

In this issue we report a demonstration staged by the Midlands Electricity Board at its Upton Warren testing station to show the operation under service conditions of a number of automatic circuit reclosers for use on 11 kV overhead line networks. The scheme for using this type of equipment was put forward by the chief engineer to the Midlands Electricity Board, Mr. G. F. Peirson, in 1950, after a productivity team from the British electricity supply industry had visited the United States in 1949. The demonstrations at Upton Warren showed the operation of both American and British made reclosers when dealing with the types of faults, both transient and permanent, which are likely to occur on rural overhead networks. All types of transient faults were cleared with merely a flicker on the supplies to the consumers in the vicinity. The demonstration reclosers provided for two high speed trip operations to deal with transient faults, followed by two slow speed inverse time trip operations enabling fuses in series to operate under permanent fault conditions and so localize the interruption of supply. Last year about 1,200 faults occurred on rural networks in the Midlands, of which 900 were due to transient conditions and could have been avoided by the use of reclosers, which would also considerably reduce the cost of replacing blown fuses after heavy lightning storms. Another complementary development which we saw last week and which is likely to be of great importance in rural areas, is the experimental introduction of special tools enabling engineers to work on "hot" lines, thereby reducing the number of planned interruptions to the supply. Very approximately the number of planned interruptions in rural areas is between 30 and 40 per cent of the total.

SOMETHING FOR NOTHING?

In our description of the Ferranti domestic heat pump ("Fridge-Heater") in this issue it is said that the amount of heat given up by the vapour is three times greater than the amount of heat (supplied as electricity) required to drive the compressor. This seems to us to be a reasonable assessment, but in some quarters the heat pump has been the subject of some ridicule, it being held that the pump is something of the dream of every engineering beginner—perpetual motion—or an attempt to get something for nothing. All this is based on the truism that the output energy of any machine cannot exceed the input energy. But in the heat pump the energy is already there in the form of heat and the problem is merely one of heat transfer from one place or substance to another, i.e., in the case cited, from the larder contents to the water.

STORAGE HEATERS

Long-term electric heating at the normal price does not compare favourably in cost with some other methods. Its advantages certainly offset some of the difference but it is the cost which generally governs the choice of heating system when a choice is available. Moreover electric heating is likely to prove embarrassing to the electricity supply authorities at times of heavy load. In spite of these adverse factors electricity is a convenient, healthy and efficient heating agent. It has long been known that the disadvantages can be overcome by some form of thermal storage at night at special rates. Domestic consumers, with their insistence on "visible" heat, have not yet been converted to this sensible method, but there is a growing appreciation of its merits in industrial and commercial circles. Storage heating forms the subject of an article in this issue by Mr. W. F. Walton of the London Electricity Board. In this the case for thermal storage systems is supported by results from actual installations. Of course for industrial and commercial use the way of storage heaters is made easier by the absence of purchase tax. There are good economic grounds for extending this immunity from tax to domestic heaters—a point which the British Electrical Development Association might put to the Chancellor of the Exchequer when making its next pre-Budget representations.

RURAL ELECTRICITY

Farmers everywhere are clamouring for electricity and all the Electricity Boards are doing their utmost to satisfy them. Rural extensions over long distances are expensive and likely to be unremunerative. Some contribution to the cost can be expected from farmers, but even then the service must be given at a loss unless an adequate revenue is obtained. The Boards find that too often rural consumers want electricity merely for lighting and other small uses and they are engaged in persuading these customers to make fuller use of the electricity so expensively brought to them. For this reason the Boards must have welcomed last week's *Farmer and Stock-Breeder*, many pages of which were devoted to the subject of making the best use of electric power. In a foreword Lord Citrine, chairman of the B.E.A., stressed the points which we have mentioned and he was backed up by Mr. S. F. Steward, the chairman of the South Western Board, whose area probably has a greater proportion of rural population than any other. Mr. Steward and other well-known electrical men also gave much useful advice on the applications of electricity on the farm. The *Farmer and Stock-Breeder* has considerable influence among the farming community and so the space given to this subject can be regarded by the electrical industry as very valuable aid.

EQUIPMENT DESIGN AND MISUSE

The annual report of the Factory Department of the Ministry of Labour and National Service on electrical accidents, referred to elsewhere in this issue, stresses the point, in regard to switchgear in particular, that it is not the design of the equipment which is usually the root cause of the accident, but carelessness and disregard to safety rules by the supervising staff. From the safety aspect, however, it is the possibility of misuse which strongly influences the design and must continue to do so. On the other hand it is quite impossible to make all or perhaps any equipment absolutely foolproof, and all possible educational work to ward off carelessness must continue.

OIL-FILLED CABLES

Development and Progress During Last Twenty-Four Years

By A. L. ASHTON, B.Sc.(Eng.), M.I.E.E.*

THE oil-filled cable was originally developed by Emanueli in Italy where a successful 132 kV trial installation was made in 1924. In 1927 very large 132 kV installations were made in the United States. The first English installation was a short length of 66 kV feeder comprising three single-core cables installed in 1928 on the North-Eastern Electric Supply Co. system. On the inception of the grid scheme the Central Electricity Board decided to install in the London area 11½ feeder miles of 66 kV oil-filled cables and 27 feeder miles of 132 kV cables. The first of these was commissioned in 1931 and all the cables were single-core. In this country there are now about 110 feeder miles of 132 kV cable, 300 miles of 66 kV and 520 miles of 33 kV cable, of various makes, installed or in process of installation.

Hydraulic Theory and Design

The principles of the hydraulic design of oil-filled cable installations are well known and have been fully dealt with elsewhere, but a brief account of some of the salient features will be given.

The cable is provided with longitudinal oil ducts which are in direct communication with the dielectric throughout its length, thereby facilitating thorough impregnation during manufacture. When the cable is laid, these ducts are connected to external sealed reservoirs of degasified oil, which control the oil pressure in the cable during heating and cooling cycles by accommodating expansion, and feeding back oil on the cooling of the cable.

In single-core cables the oil duct is usually in the centre of the conductor which is stranded in the form of a hollow core. In three-core cables three oil ducts are provided in the "filler" spaces between the cores.

Oil pressures may be steady hydrostatic pressures constant over long periods, upon which are superimposed transient pressures of short duration due to changing load conditions in the cable. All parts of the cable system must, at all times, be under a positive pressure of oil, i.e. at a pressure above atmospheric. Furthermore, the pressure must not at any time exceed the maximum permissible figure for the cable or component concerned.

In present practice the minimum permissible pressure is fixed at 2–3 lb/sq in, while the maximum pressures vary between 30 and 75 lb/sq in under static conditions, and are allowed to rise to well over 100 lb/sq in under transient conditions. The "static" pressures depend on the physical profile of the cable and its steady state of loading, while the transient pressures are related to the rate of absorption or emission of oil, into or out of the cable, due to temperature changes and to the frictional resistance to flow in the duct which, in turn, is related to the oil viscosity, the size of the duct and the length of the cable.

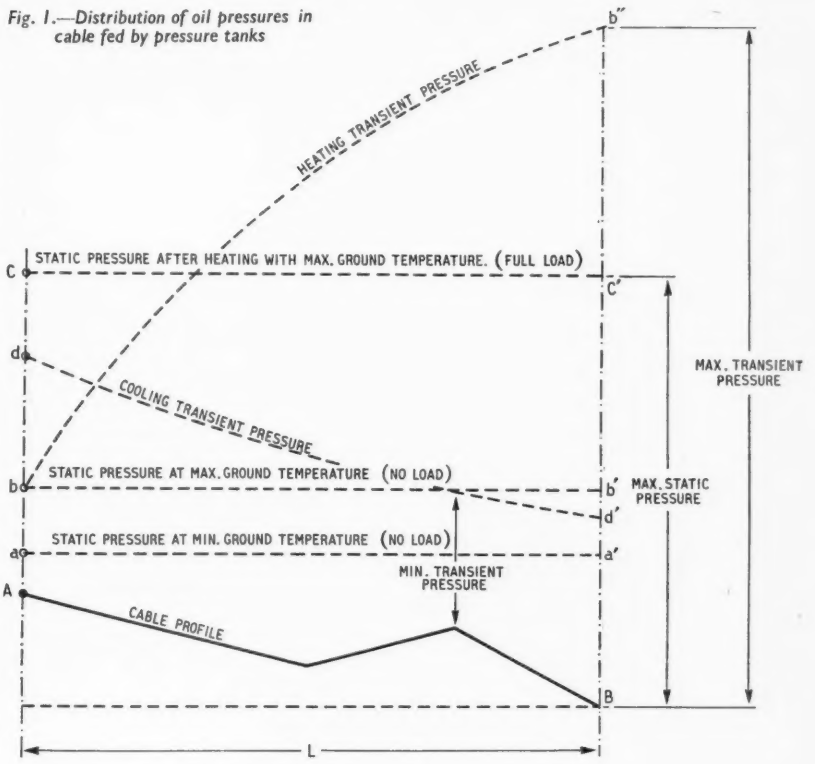
Transient maximum pressure occurs when switching full load on to a dead cold cable, and the minimum transient when switching all load off a cable carrying 70/80 per cent of full load; these conditions are considered in the design.

Originally, cables were fed by "gravity" type tanks consisting of flexible-walled cells containing oil at or about atmospheric pressure. As the maximum length of cable fed in this way from one end only was very limited by the transient pressure conditions, pressure tanks were sometimes installed at the remote end of a cable section to act as a pressure relief during transient conditions, by temporarily accommodating oil emitted from the cable and feeding it back when required, thus enabling longer

* Pirelli-General Cable Works, Ltd.

† "Three-Core Oil-filled Cable," by R. E. Horley, *G.E.C. Journal*, Vol. V, No. 4, November, 1934; also Pirelli-General Oil-filled Cable Handbook.

Fig. 1.—Distribution of oil pressures in cable fed by pressure tanks



sections of cable to be fed. It was often necessary to mount these tanks above ground level, and in view of the problems of accommodation thus created this method of feeding was discontinued. Since about 1930 oil feeding has normally been carried out by pressure tanks only.

Pressure-Volume Relationships

A pressure tank comprises an oil container accommodating a number of sealed gas-filled cells which contract and expand according to the pressure conditions in the cable. Fig. 1 shows the distribution of oil pressure in a cable section fed from one end.

The pressure-volume relationships of typical pressure tanks are shown in Fig. 2. The lower curve shows the characteristic for a " normal " type tank (i.e. one in which cells are assembled at atmospheric pressure), and it will be noted that at the high pressure end a given volume of oil V admitted results in a greater increase in pressure than at the lower end of the curve. Consequently this type of tank has limitations at high pressures. To meet these conditions a tank containing pre-pressurized cells has been introduced, and is now freely used as an alternative to, or in conjunction with, normal type tanks.

The pre-pressured tank differs from the normal type tank by cells being filled with gas at a pressure above atmospheric, although they are constrained to occupy the same volume when assembled. This results in a different pressure-volume characteristic which is shown in the upper curve; thus for a given increase in pressure a larger volume of oil V can be accommodated at a high pressure than in the case of the normal tank. This type of tank cannot be used for lower pressures than that at which the cells are assembled. The use of pre-pressured tanks also has the advantage that higher pressures may be maintained in the cable, thus permitting longer lengths to be fed.

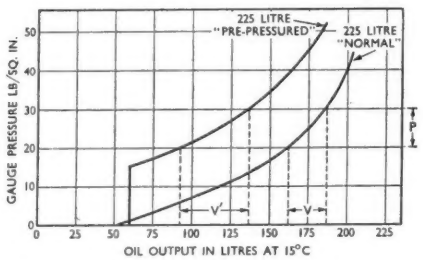


Fig. 2.—Comparison of pressure/volume curves for " normal " and " pre-pressurized " type tanks

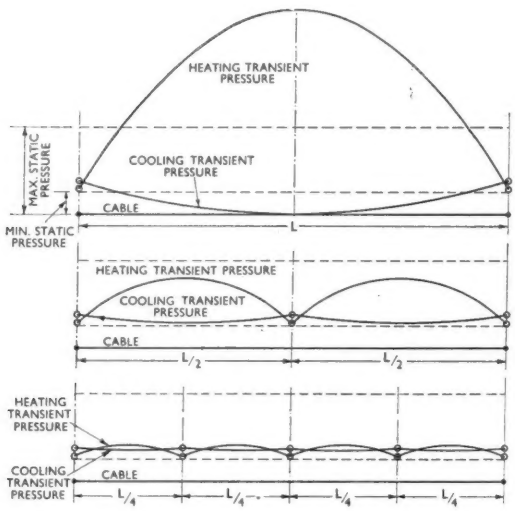


Fig. 3.—Distribution of oil pressures in a horizontal cable profile with alternative distribution of pressure tanks

To illustrate the comparative effect of static and transient pressures on the hydraulic design it is interesting to consider two extreme profile conditions, i.e. the case of a cable having a horizontal profile, and that of a vertical profile (see Fig. 3). The total gas volume of the pressure tanks required is determined by the total oil expansion of the cable and the maximum static pressure permissible which is the same in each of the cases shown.

It will be seen that the distribution of tanks on the cable route is determined solely by transient pressure conditions. Thus the distribution of tanks can be varied from the provision of a few large tanks spaced at long intervals to that of a larger number of smaller tanks at more frequent intervals. Theoretically there is no need to subdivide the cable by stop joints, but it is customary to provide some segregation in the event of damage causing oil leakage. Furthermore, on going to the limit, the cable itself might contain its own continuous pressure tank or other means of accommodating oil expansion. Fig. 4 illustrates the case of a vertical cable where transient pressures are small compared with static pressures, and it is necessary to subdivide the line at intervals with stop joints to limit the maximum hydrostatic head.

The foregoing typifies the problems involved in planning the feeding arrangements for an oil-filled cable installation. In most cases the profile to be considered is undulating and advantage is taken of the natural configuration of the route in positioning the tanks.

Gas Generation

The first 132 kV cable installed was commissioned late in 1931. A few weeks later it was found that certain gravity type feed tanks had become distended. An examination showed that they contained hydrogen at a fairly high pressure and that the oil duct of the adjacent cable also contained hydrogen. After re-impregnating the cable in the ground, breaking down and examining the joints, and electrically testing the cable and joints, the only abnormality disclosed was that one of the straight joint sleeves contained gas under pressure instead of being filled with oil. Further cases of gas generation soon occurred at other points on the route, and in every case the same abnormality was present in a joint. It was also found that all the joints concerned were situated at low pressure areas in the cable system, the oil pressure being below about 18 lb/sq in.

Investigations into the behaviour of oils under stress showed that for any type of oil at a given pressure, there was a critical electrical stress above which gas would be generated, due to ionic bombardment within voids enclosed by the oil. At a little below this critical stress, any free gas would either be absorbed by electrically stimulated chemical reactions with the oil, or would remain indefinitely more or less in equilibrium with it, depending on the chemical characteristics of the oil. Highly refined oils would not absorb gas at any stress but, at the stresses existing in the dielectric of these cables, might generate gas unless the hydrostatic pressure was above a certain value.

Simple apparatus was devised by Emanueli to demonstrate the behaviour of oils towards gases under stress, and in its modern form is shown in Fig. 5. It comprises an annular chamber B in which the oil and a selected gas are submitted to stress between the inner mercury electrode A, and the outer metal foil electrode C. The change in volume of gas according to whether there is generation or absorption

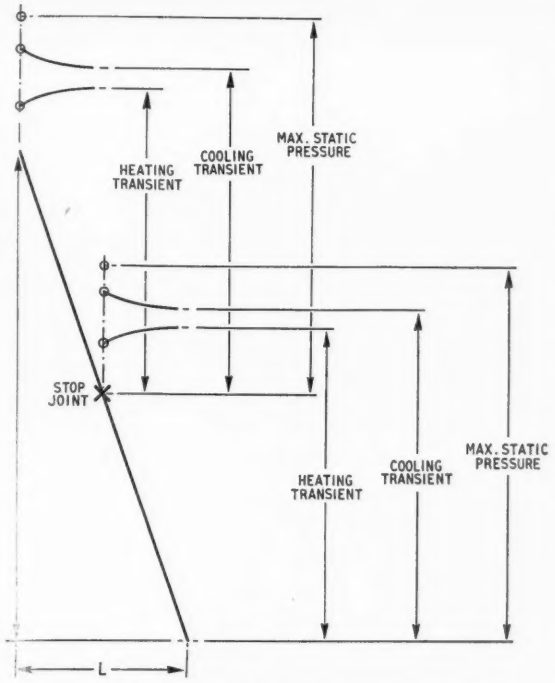


Fig. 4.—Distribution of oil pressures in a vertical cable

by the oil is shown by the alteration of oil level in the side tube D.

With this apparatus it was possible to establish the degree to which an oil could be refined without destroying its ability to absorb gas under the conditions of electrical stress existing in the cables, and to determine what proportion of an oil-soluble hydrocarbon containing "unsaturated" or "aromatic" groups, should be added to refined oil to confer gas absorbing properties. The apparatus has since enabled manufacturers to check the stability of oils before use.

The oil used in cables up to the time of this investigation was in the "highly refined" category and liable to generate gas if air should be present in a highly stressed zone of the impregnated dielectric. To eliminate the gassing tendency the free oil in the cable duct was replaced by a strong solution of pure naphthalene in a less highly refined oil, naphthalene having a great capacity for absorbing hydrogen gas under stress.

This was done by pumping the new naphthalene-oil mixture in at one end of each oil section and allowing the original oil to flow out at the other end, until the central duct of the cable contained the desired new mixture. The normal temperature changes in the cable during its subsequent operation were found to be sufficient for diffusing the mixture into the dielectric.

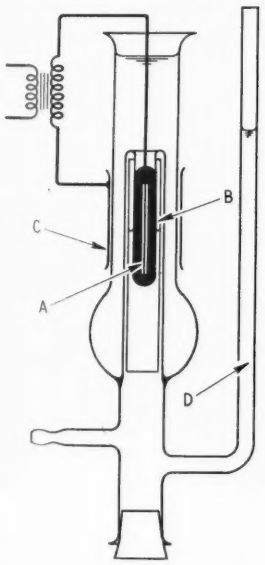
As it was found that the initial gas bubbles necessary to initiate gas evolution were trapped during jointing operations, it was also decided to re-impregnate all joints below a pressure of 18 lb/sq in with the replacement naphthalene-oil mixture. This was carried out on all the original 132 kV installations and on some of the 66 kV cables, although in the case of the latter, gassing troubles were much less in evidence due to lower stress gradients. As all the cables are still operating satisfactorily, it can be assumed that the cure was effective.

Leakage Indication and Localization

Various devices have been developed to indicate loss of oil and to localize the section of cable in which it may occur. They have been designed to operate at a definite low oil pressure or alternatively by a comparison of pressures. The first condition is covered by the use of a low oil pressure indicating (L.O.P.I.) switch.

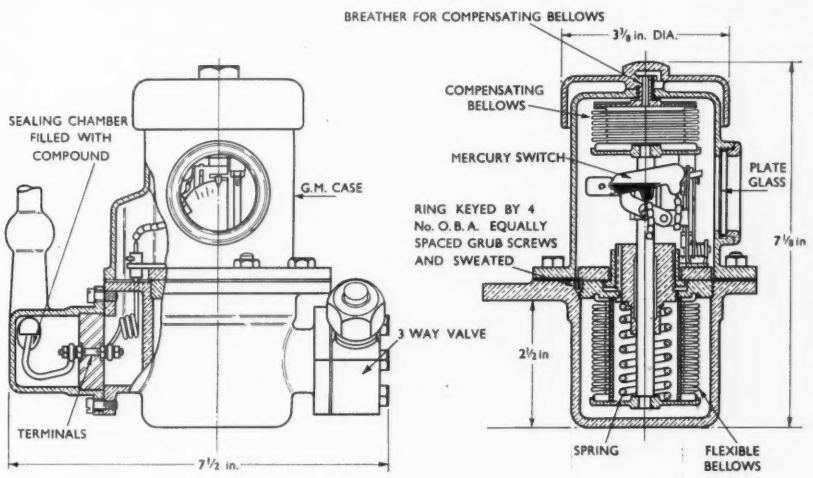
The latest design (Fig. 6) comprises a spring-loaded flexible bellows which is normally compressed by external oil pressure, the oil container being connected to the cable oil system. On lowering the oil pressure to a predetermined value, the mercury switch trips and actuates a signal. A feature of this switch is the use of a compensating bellows to cancel out the effect of temperature changes in the air in the switch casing.

As an alternative to the L.O.P.I. switch a contact type pressure gauge has been used. Consideration of the pressure conditions in the cable under varying loads shows that a switch operating at a definite pressure must be arranged to act below minimum operating pressure in the cable even if a leak should occur while the cable is loaded. It is thus desirable to have an alarm which takes



Left: Fig. 5.—Apparatus for testing gas absorption or generation in oil

Below: Fig. 6.—Latest pattern of low oil pressure indicating switch



account of load variation. This has been done by developing differential switches which compare oil pressures in different phases or sections of the cable.

In the case of a feeder comprising three single-core cables separately fed, all three phases should behave in the same way under all conditions of load. The fundamentals of a switch which compares the oil pressures in the three phases are shown in Fig. 7. It operates at a specified difference in pressure between phases and consists of three pairs of bellows, connected as shown and with each pair loading opposite ends of a biased beam, the fulcrum of the beam being adjustable to vary the percentage pressure difference. The unbalancing of the beam, due to loss of pressure in one bellows, causes a mercury switch to trip.

The pressure-operated devices so far described are not suitable for installations employing gravity type feed tanks. To meet this need, a switch known as the low volume indicating switch has been used. Here the feed tank is mounted on a cradle pivoted on knife edges at one end and supported by springs at the other, loss of weight in the tank operating a mercury switch.

Transmission of the alarm signal to the cable termination is simple and a typical circuit is shown in Fig. 8. The alarm switches are connected to pilot wires, and the

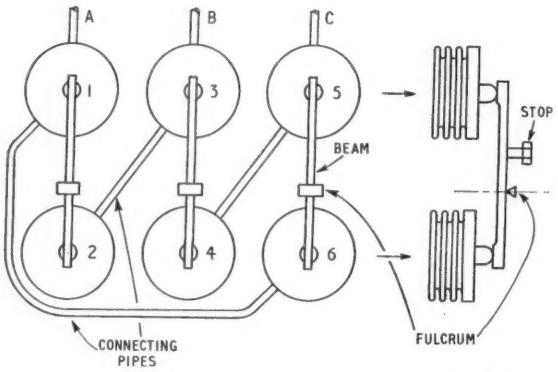


Fig. 7.—Three-phase differential oil pressure indicating switch

location of the tripped switch is effected by the use of a Murray loop test. This circuit employs a continuous circulating current in the pilot wires and indicates failure of this current either by reason of an open circuit or mains supply failure. The localizer will only indicate the position of the switch which has operated; the method of finding the point of leakage is another matter.

The devices described do not constitute "protective devices" in the generally accepted sense of the word. Their operation does not normally require the cable to be taken out of commission, and unless the rate of oil leakage is very high, cables can be maintained in commission indefinitely, provided the loss of oil is made good.

At first sight, the precise location of an oil leak is simple, using methods analogous to electrical fault finding. However, a complication arises which does not occur in electrical tests. Owing to continuous changes in ground temperature, there is normally a flow of oil into or out of the cable, and this may be such as to cause a flow equal to, or even greater than, the leak itself.

The pressure conditions in a cable containing a leak are shown in Fig. 9, which also illustrates the principle on which a localization method using a loop test is based. This test is normally applied to a feeder of three single cores. In the diagram, the continuous line shows the pressure gradients due to the leak and the broken line those due to oil absorption caused by temperature change in the cable. The two lengths L represent two single cables looped together at one end, with the two sight tubes of the oil leak localizing set at the other, the position of the leak being at a distance X from the looped end. The diagram shows the two phases in an "unfolded" condition. In practice the two sight tubes are side by side at the top ends of the two phases, and the centre of the loop is at the end.

In carrying out the test, the leaking cable and one sound cable are looped at the end remote from the testing point; the third cable is used for temperature correction. Considering only the pressure gradient due to leakage, it will be seen that if the oil pressures at each side of the loop are maintained at the same value, the pressure drop to the point of leakage will be the same. As under these conditions the rate of flow is proportional to the frictional resistance of the cable, which in turn is proportional to the length, the ratio of oil flowing into both sides of the loop will be the inverse of the ratio of the lengths of cable between the testing point and the point of leakage. The gross volumes of oil flowing into or out of each of the two looped cores are measured over a definite time, and a correction for flow due to temperature change is applied to these readings, it being assumed that all three cores are equally affected by temperature.

The apparatus for this test (Fig. 10) comprises three

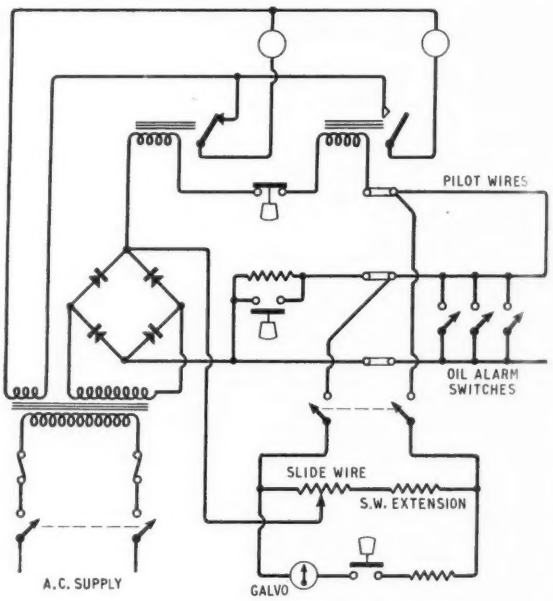


Fig. 8.—Typical alarm circuit

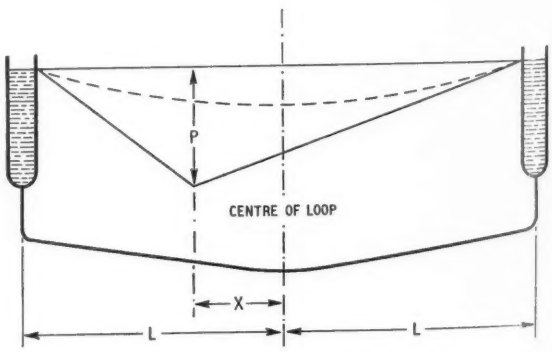


Fig. 9.—Principle of oil leak localizing test

glass sight tubes, each connected to one single-core cable. All other feeds being disconnected, the oil in these tubes is kept at exactly the same level by manipulating three screwed pistons which enter cylinders and are calibrated with micrometer scales. Thus, during the test oil volumes entering or leaving the cables are measured on the micrometers. This method has proved successful under favourable conditions, but due to temperature differences between the individual cores and other disturbing causes, results are often approximate.

The location of an oil leak is more difficult in the case of a three-core cable. A trial-and-error method which is often used when only one cable is available, is to effect a temporary stoppage of the oil duct and observe on which side of the stoppage leakage is occurring.

In the case of a three-core cable, this can be done by temporarily closing the oil communication at a joint and observing oil flow on both sides. In this way the leakage can be located to a given drum length of cable. To locate the leak within this length, or to trace a leak in a hollow core cable, the stoppage is created by freezing the cable with liquid oxygen. Observations are then made to find the direction of the leakage flow.

One of the reasons for the development of the various methods of leak location described above was the occasional occurrence of defective longitudinal seams in the lead sheaths of some of the earlier cables. The development of extrusion machines which produce seamless sheathing has largely eliminated defects of this type.

Cables and Accessories

During the period under review considerable developments have taken place in the design of cables, joints and accessories. In the case of cable design, a big increase in maximum dielectric stress value has taken place since the earlier period; for example in the case of the original 132 kV cables the maximum design stress was 75 kV/cm; a figure of 90 kV/cm has been used on recent designs. A 310 kV cable which has been installed in Canada has a maximum stress of well over 100 kV/cm.

The thinner dielectric wall effects economies in the construction of the cable itself, and there is consequently some economy in the sizes of oil feeding tanks. Further economies have been achieved by the simplification of the outer protection of the cable. Most oil-filled cables made between 1930 and 1937 had two lead sheaths, the inner one being the oil-retaining sheath which was reinforced against internal oil pressure with metal tapes, the outer sheath forming a protective covering. Present-day cables normally have only one lead sheath, the pressure reinforcing tapes being protected by p.v.c. or rubber, which effectively prevents any corrosive action from the medium in which the cable may be laid.

To indicate the measure of economy obtained by the omission of the outer lead sheathing and the reduction of dielectric thickness, it is sufficient to say that the weight of lead in a 1930 type of 0·20 sq in 132 kV cable was about 12½ tons/1,000 yd against the present-day figure of 4¼ tons/1,000 yd. Maximum permissible conductor temperatures have also been raised, the present figure being 85 deg C compared with 75 deg C 24 years ago, and in at least one case a maximum temperature of 100 deg C has been permitted for an occasional short time peak load period.

Further developments include single-core cable having oil-ducts formed in the sheath. Known as the "fluted lead" type, it is mainly used for comparatively short lengths of single-core tails terminating three-core cables. By its use the design of trifurcating joints is considerably simplified.

A three-core cable having leakage indicator wires enclosed inside the main cable has also been used. Another type of three-core construction consists of three single hollow-core cables separately lead sheathed and enclosed in one outer armouring. To improve the thermal characteristics of three-core cable, copper instead of steel spiral oil ducts have sometimes been employed. The range of sizes of conductor used has varied from 0·1 sq in to 1·5 sq in in single-core cable and from 0·1 sq in to 0·6 sq in in three-core construction. A recent development is an oil of lower viscosity than the original type, which reduces frictional losses in the ducts, thus reducing transient pressures.

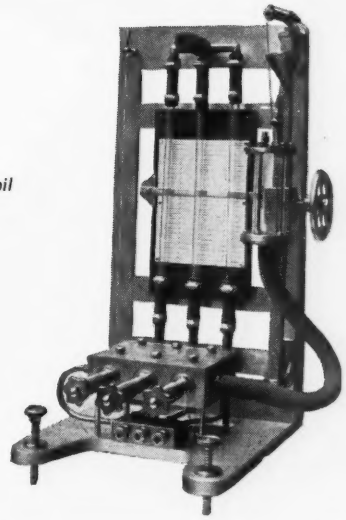


Fig. 10.—Instrument for oil leak localizing test

The paper used in the dielectric wall has been improved by advanced technique in paper manufacture, and much consideration has been given to lapping operations to ensure precision of registration and control of tension.

A further development has been the use of aluminium sheathing, which effects considerable economies in the case of three-core cables. This type of cable need not have external reinforcing tapes and spiral oil ducts are unnecessary. Many detailed improvements have been made in the design of joints and accessories which it would be too lengthy to describe in detail. One important development, however, is the use of oil immersed sealing ends, which enable cables to be connected directly into transformers or switchgear.

Previously it has been normal practice to provide outdoor sealing ends for the cables and external porcelain bushings in the apparatus to which it was connected. With the co-operation of transformer and switchgear manufacturers, oil immersed sealing ends have been used increasingly during the last few years, effecting considerable economies in the combined installation and at the same time providing the advantages of totally enclosed connections.

Installation Methods

Installation practice has undergone certain changes during the period under review. The reduction in weight and diameter of cable facilitates the laying of longer lengths and these are frequently laid by a power winch, thereby saving manpower.

When feed tanks of the "gravity" type were used it was often necessary to provide accommodation for the required physical head above ground level. It was sometimes convenient to use existing buildings at the terminations, but in some cases high and costly structures had to be built. By taking advantage of the high points on undulating cable profiles, however, a comparatively low elevation was

often found adequate which could be provided in buildings of small dimensions. In many cases on a rapidly falling profile, feed tanks were accommodated underground in concrete chambers.

With the present system of oil feeding, using pressure tanks only, the need for physical head has ceased to exist, and very much simpler and cheaper means of accommodation are employed.

Where there are a large number of tanks and joints at one point, underground concrete chambers are used occasionally. Normal practice, however, is to accommodate the pressure tanks in separate individual concrete tubes buried direct in the ground.

The majority of oil-filled cables laid in this country have been buried direct in the ground. Occasions, however, have arisen where special methods of installation have had to be adopted. Details of some of these installations, together with installations having other interesting features, are given in the following brief survey.

During the war about $1\frac{1}{4}$ miles of 132 kV overhead grid line in the south-west Scotland area was replaced by a 132 kV underground oil-filled cable. This involved crossing two rivers, the Black and White Carts, both tributaries of the Clyde. The crossing of the Black Cart was carried out by dredging a trench in the bed of the river and laying the cable from drums mounted on floats. The cable was 132 kV single-core, 0·3 sq in armoured, with a single layer of cadmium copper wire. The three single-core phases were laid simultaneously, being bound together as they were laid into the bed of the stream. As the White Cart was shallower the cables were pulled across at low tide, supported temporarily on a timber structure, and were then buried in a trench dug by hand during low tide.

This crossing was carried out during the installation of 33 kV oil-filled cables for the Ipswich Corporation in 1946. It was necessary to lay a cable in the bed of the Orwell across the face of the main lockgates at the entrance to Ipswich Harbour, the crossing also being continued across the "New Cut," another branch of the Orwell. The cables were laid direct in the bed of the river in dredged trenches and were protected by concrete bags. A special construction was adopted to lead the cable up the vertical wall at the quayside, the cables being cleated in a vertical concrete chase and protected with concrete slabs.

A more recent installation has been made in Shoreham Harbour Tunnel comprising two 132 kV feeders, consisting of two trefoil groups of single-core, 0·3 sq in, single steel-armoured cables. The tunnel provides the exit for cables from Brighton "B" power station and is constructed under the bed of the harbour. The two tunnel shafts are vertical, being 86ft deep on the south side and 100ft deep on the north side, the width being 175ft.

A large 132 kV oil-filled cable installation was recently carried out connecting Brunswick Wharf generating station at Poplar and the B.E.A. distribution centre at Islington. The cables were normally laid direct in the ground in trenches, but tunnels were driven under some of London's busiest main roads: for instance, East India Dock Road, Hackney Road and Bow Road. A special cable bridge was designed and erected to carry the cables over the Regent's Canal. Two feeders were laid in the same trench, each being capable of transmitting a continuous load of 120 MVA. The cross-sections vary from 0·5 sq in to 0·75 sq in to suit the various laying conditions encountered.

An interesting installation has just been completed at the hydro-electric power station at Kemano in British Columbia for the Aluminum Company of Canada, Ltd., subsidiary of Aluminium, Ltd. The installation comprises an oil-filled cable which will operate at 301 kV and which forms the termination into the power station of the transmission line between Kemano and the aluminium smelting works at Kitimat. The cable consists of a three-phase feeder made up of single, hollow core phases and is believed to be the highest voltage cable to be put into operation in the North American continent.

The cable has been laid in wood cleats in a cable tunnel between the underground power station and the switchyard at which the transmission lines terminate. When in commission the cable will carry the output of two generators, i.e. a total of 213 MVA, its maximum continuous rating being 287 MVA.

A further installation of oil-filled cable has recently been put into commission at the high voltage cable testing station at Staythorpe established by the B.E.A. In this case the cable is built for 275 kV and is installed with other types of high voltage cable.

The author wishes to make acknowledgment to the various Authorities referred to for permission to publish the information relating to the installations mentioned and to the Council of the Institution of Electrical Engineers for permission to use some of the information contained in his Chairman's Address to the Southern Centre in October, 1951.

Tests on Wood Preservatives

A RECENT publication of the Department of Scientific and Industrial Research, Forest Products Research Bulletin No. 32, is "Field Tests on Wood Preservatives used for Pressure Treatment," which is available from H.M.S.O., price 2s 6d, by post 2s $7\frac{1}{2}$d.

Field tests on wood preservatives have been carried out at the Forest Products Research Laboratory since 1928, and results obtained up to the end of 1953 on preservatives normally applied under pressure are given in the present publication. A certain amount of information about the toxicity of preservatives and its endurance can be learned from laboratory tests, but at present the only satisfactory method of measuring their effectiveness is the field test.

The tests reviewed are limited to those on preservatives normally applied under pressure. These are comparatively few and of two types, namely, oils and water soluble salts. The oil preservatives include coal tar creosote and mixtures of coal tar creosote with a mineral oil or with coal tar. Solutions of copper naphthenate or pentachlorophenol in a mineral oil are also used. The principal water-soluble preservatives are various proprietary mixtures of salts available under trade names. The long term field tests were carried out by treating specimens of wood with the preservatives and setting them about half their length in the ground side by side with untreated controls. The tests were duplicated at three different sites to offset the variation in results caused by locality. The timbers used were four common home grown ones, oak and beech representing hardwoods, Scots pine and Douglas fir representing softwoods. The publication describes the different types of preservatives, the nature of the tests and the results so far obtained.

DOMESTIC ELECTRICITY

Next week's issue of the "Electrical Review" will be the annual Domestic Number. In addition to special articles on domestic electrification topics, the issue will contain illustrated reviews of all classes of household electrical appliances showing recent introductions and developments.

Storage Space Heaters

An Account of Recent Practical Experience

By W. F. WALTON, A.M.I.E.E.*

FOR many years electric space heating has been desired by consumers for its cleanliness and ease of control. Because of the incidence of the heating load, it has been necessary to charge rates which cover the demand charges for electricity consumed for this purpose. For continuous heating this results in high running costs. Supply engineers have long realized that some form of thermal storage, which would give adequate comfort conditions by day but would consume electricity by night would get over this.

Many schemes have been tried with varying degrees of success. The most common one uses water as the storage medium; many successful installations of this type exist but the application is limited because of the high capital cost and the large storage vessels which have to be accommodated. In old buildings it is virtually impossible to install a system of this type.

Rather more than four years ago, a new type of block or unit thermal storage heater was developed and installed in large numbers in Eire. These heaters consist of a block of refractory material in a metal container. The refractory material is insulated from the container by glass-wool lagging and has embedded in it a nickel-chrome element which operates at black heat. The loading of the heaters varies from 1 kW to 2¼ kW. It is claimed that sufficient heat can be stored in these during the night to maintain adequate comfort conditions throughout the following day although the heater is entirely disconnected from the electricity supply in the daytime.

The first installation of such heaters in this country was at the Irish Embassy in London, where something over 200 kW was installed. Electricity was connected only between the hours of 7 p.m. and 7 a.m. The results of this installation were so satisfactory that two Electricity Boards decided to carry out further investigations and several other smaller installations were connected with equally satisfactory results. Since that time, a very considerable number of these heaters have been installed.

The time is now opportune to review the progress made, the results obtained, and the possible future development and market for this type of space heater. There are two points which must be considered. First, whether this type of installation provides comfort conditions at least as satisfactory as more orthodox methods, and secondly, how the capital and operating costs compare with other methods.

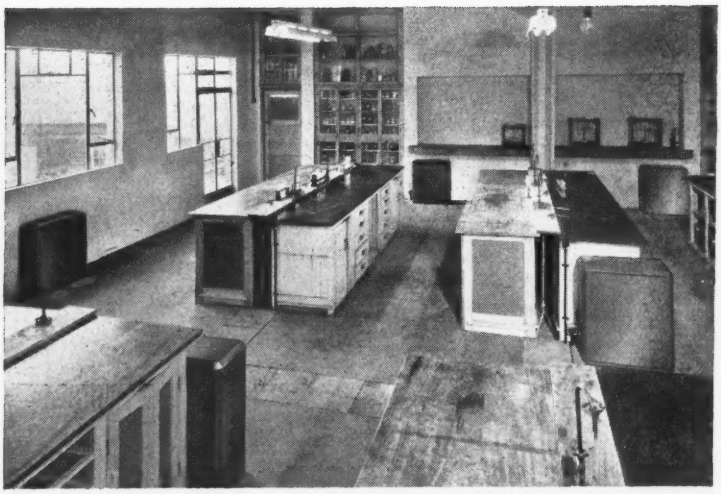
Equipment Available

At the present time, there are two suppliers of block storage heaters in this country, Thermodare (Gt. Britain), and the General Electric Co., Ltd. These companies market heaters of various sizes but the appliances made by both are basically similar, with of course different manufacturing details. The price of the heaters varies from £11 to £15 and they are not subject to purchase tax, on the understanding that they are for commercial and industrial use only and not installed in domestic premises. The cost of installation is, therefore, comparable with any form of direct electric heating and is very considerably below that of hot water systems.

The block heaters receive their charge during the night; the actual charging period varies according to local conditions and the total wattage installed per cubic foot of heated space, but generally it can be said to vary inversely with the outside temperature.

* London Electricity Board.

Thermodare units in Aldershot Public Library



"Nightstor" heaters in the chemical laboratories of the Salesian College, Oxford

St. Olave's Church, Stoke Newington, is equipped with Thermodare heaters

Approximately a third of the heat input is given out to the building during the night and the remaining two-thirds during the following day. The essential difference between the modern block storage heaters and earlier types is that by reason of the lagging and controlled heat loss, the heaters are capable of retaining sufficient heat to maintain comfort conditions throughout the day with the electricity supply disconnected.

Heat Requirements

When determining the electrical loading required for any particular building, the basic heat losses are calculated in the orthodox manner and the required loading of block heaters to heat any given space is ascertained in exactly the same way as would be employed for any direct space heating equipment designed for continuous heating.

With storage heaters, building construction must receive consideration. In all thermal storage installations, the heat storage of the fabric itself is important. The table indicates that the heat requirements vary according to the type of premises, construction of buildings, temperature required and other local factors, but in general the figure varies between 0·8 and 1·3 W per cubic foot of space to be heated.

It has been found in practice that the majority of commercial and business premises provide quite suitable conditions and in the few cases where insulation is poor it can often be improved at small cost with a resultant saving in initial capital outlay for heating equipment and in running costs.

Control

The apparent lack of control of thermal storage heaters has in the past been considered one of their main disadvantages. A considerable amount of experimental work carried out some years ago in Eire by the Public Works Department showed that by using standard room thermostats to control the amount of charge taken by the heaters during the night period according to the temperature inside the building, very satisfactory control could be obtained.

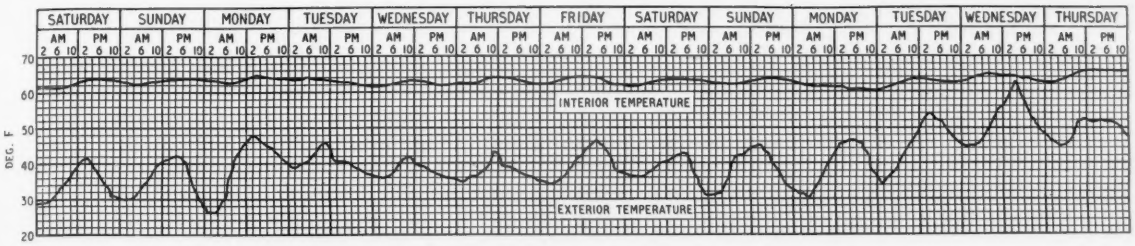
It might be argued that such a system would fail in the event of a large difference in temperature between the night and the following day. In practice, however, this does not occur. In this country the difference between the day and night temperatures in winter is not extreme and the heat storage of the building itself helps to iron out such fluctuations as there are.

The normal procedure is to arrange for individual or pairs of heaters to be controlled by standard room thermostats. In a large space with comparatively even heat loss, satisfactory results can be obtained by installing a single thermostat to control all the heaters by means of a contactor. Recently a certain amount of experimental work has been done, using an outside thermostat in conjunction with one inside. Although in theory a more satisfactory control should result, it will be noted from the thermograph chart that entirely satisfactory results can be obtained by using a simple room thermostat. It is doubtful, therefore, if the additional expense and complication of adding an outdoor thermostat is justified.

The use of thermostats for the control of heat input to the block heaters not only ensures satisfactory comfort conditions but also results in lower electricity consumption.

From information which has now been collected from the many installations already operating in this country, it has been possible to establish data from which the consumption of any installation can be estimated with a considerable degree of accuracy. In general, however, the same formula as applied to any normal thermostatically controlled space heating installation gives satisfactory results.

The table gives actual consumption figures over a period of 12 months for various installations. In general, it may be taken that to provide a temperature difference of 30 deg F, consumption of the order of 1,000 kWh per kW installed per annum will be required. To provide a temperature



Temperature chart of a typical Thermodare installation (London Electricity Board)

" Nightstor " units in an Ipswich jewellers' workshop

TYPICAL INSTALLATION SHOWING LOADING PER CU FT AND ANNUAL CONSUMPTION

Type of Premises	Temp deg F	Space (cu ft)	kW installed	Watts per cu ft	Annual consumption	kWh per kW installed
Showroom	65	17,000	18	1·06	24,397	1,355
Embassy	65	270,000	228	0·8	242,198	1,060
Factory and offices ...	60·65	96,000	95	0·99	111,227	1,170*
Office and workshop ...	65	11,900	11·5	0·97	18,000	1,570
Showroom and office ...	65	9,600	9·0	0·94	12,795	1,415
Offices	60	—	55·5	—	—	1,012
Offices	65	58,000	74·5	1·3	126,247	1,290
Offices	63	11,790	12	1·02	10,558	1,130
Bank training school ...	65	15,700	19·5	1·24	31,500	1,560

* Consumption recorded between 1.11.53 and 25.6.54.

difference of 35 deg F would require some 1,200 to 1,400 kWh per kW installed per annum.

Many Electricity Boards now make available special " off-peak " tariffs and it is therefore possible for consumers to enjoy, at an economical cost, continuous heating giving good comfort conditions with all the other advantages of automatic control, cleanliness, etc., which only electricity can provide.

General Application

Block thermal storage space heaters can be used satisfactorily in most ordinary commercial and industrial premises, providing that they have reasonable thermal insulation and are mainly enclosed. It is obviously much more difficult to provide satisfactory heating in open fronted shops or industrial premises with high ceilings and wide open doors such as garages, etc. Recently a number of block thermal storage heaters have been installed in churches and church halls with very satisfactory results. In buildings of this type, it is important to ensure that the structure is such that economical operation can be expected.

Undoubtedly, some of the most enthusiastic users of this type of heating are occupiers of offices. The comfort conditions experienced on Monday mornings is much appreciated.

Effect on Distribution Network

An aspect which it is necessary to consider is the effect of large connected loads of this type on the distribution network, as it is possible that a large heating load in one building, although " off-peak," may overload the local low voltage distributors. Special thermal storage tariffs are offered only on the assumption that the connection of the load does not involve additional capital expenditure. Load curves have been taken of typical installations. In a departmental store and a factory, both normal premises, it was found that the winter night load was practically equal to the day demand. In one particular instance, the load curve was almost flat over the whole 24 hours. There is no doubt that a number of installations of this type of space heating would improve the overall load factor.

Without question, the potential market is very great and as the knowledge spreads amongst consumers that full continuous electric heating can be obtained at economic cost, the demand for block storage heaters will grow very rapidly.

As the use of these heaters becomes more widespread, new problems of application will arise and new methods of approach suggest themselves. Fundamentally, however, the equipment is of such a simple and flexible nature that it can be readily adapted to any circumstances.

There is a time control problem, however, which would seem worthy of further consideration now. Apart from the thermostatic control referred to above, the supply at present must be controlled by a time-switch, set and sealed by the Electricity Board, to restrict the hours of use. In certain parts of the country, these hours could, with advantage to the Board, be varied considerably from time to time. It is expedient to consider, therefore, whether some form of ripple control on the lines successfully employed for street lighting and water heating control in many parts of the country might not be adopted for this load.

Where the facilities for ripple control already exist on certain networks, the additional cost of suitable control gear in the consumers' premises would probably compare favourably with the necessary time-switch and contactors required in the larger installations.

Acknowledgments are due to the London Electricity Board, Thermodare (Great Britain) and the General Electric Co., Ltd., for statistical data, the chart, photographs and information used in the preparation of this article.

THE I.E.C. MEETING

Proceedings at Philadelphia

From a Special Correspondent

So much happened during the meeting (or rather the series of meetings) of the International Electrotechnical Commission held at the University of Philadelphia (which was founded by Benjamin Franklin in 1740) from 1st to 16th September, that it is only now, a few weeks after the event, that a comprehensive and balanced account can be given of the proceedings.

Out of the 30 countries which are members of the I.E.C. the following 20 were represented in Philadelphia: Argentina, Australia, Belgium, Canada, Denmark, Finland, France, Western Germany, India, Israel, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States and Yugoslavia.

The largest delegation was, naturally, the American, which was about 450 strong. The largest non-American delegation was that from the United Kingdom (96 delegates). This delegation was headed by the Viscount Waverley, immediate past-president of the British Standards Institution. The delegates, all of whom had been appointed by the British National Committee of the I.E.C. (which operates under the ægis of the British Standards Institution) included representatives of trade associations, the British Electricity Authority, the Institution of Electrical Engineers, the Electrical Research Association, consultants and manufacturers.

Among other large delegations were: France (46), Germany (39), Italy (36), Sweden (35), Netherlands (32), Switzerland (20) and Japan (10). There were also present the president and general secretary of the International Organization for Standardization (I.S.O.) and representatives of several of its member-bodies and of several other International Organizations which co-operate with the I.E.C., including the International Bureau of Weights and Measures, International Commission on Illumination, World Power Conference, International Union of Producers and Distributors of Electrical Power and International Conference on Large Electric Systems (C.I.G.R.E.). The total number of registrations (including ladies accompanying delegates) was over 1,000.

The proceedings fell broadly into three main categories, namely:—

(1) The Golden Jubilee Celebrations.
(2) Meetings of the Committee of Action, Council and Technical Committees.
(3) Technical Visits and Social Events.

Golden Jubilee Celebration

One day, 9th September, was devoted to the celebration of the golden jubilee of the I.E.C., under the chairmanship of Dr. H. S. Osborne (U.S.A.), president of the I.E.C., who recalled the early history of standardization in the electrical field, in particular the meeting of the International Electrical Congress at St. Louis in 1904, at which Colonel R. E. B. Crompton presented a paper on "Dynamo-Electrical Machinery and Apparatus." The following discussion emphasized the importance of standards which were not merely national but represented international agreement. It was resolved that "international standardization be urged upon the chamber of delegates for their attention and also that the A.I.E.E. be asked to take up this matter and place itself in communication with the I.E.E. of Great Britain for such further consideration of this subject as may seem advisable." The outcome was the formation of the I.E.C., the first full meeting of which was held in 1906, when Lord Kelvin was elected the first president.

Then followed the four addresses which constituted the main feature of the Jubilee Celebrations.

Dr. Hakan Sterky, Director General of Telecommunications (Sweden) and M. Pierre Ailleret, Director of Research, Electricité de France, then presented addresses on "Past, Present and Future Telecommunications Standardization" and "Fifty Years of International Standardization in the Electrical Power Field" respectively.

At the afternoon session the proceedings were opened by a speech by General Charles E. Saltzman, Under-Secretary of State for Administration, who at short notice attended the meeting in the place of Acting-Secretary Walter Bedell Smith. This evidence of the interest of the U.S. Government was much appreciated.

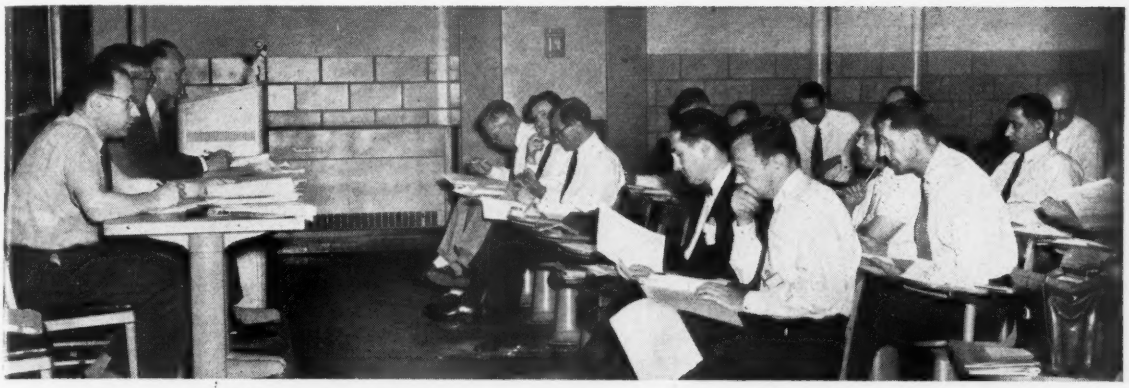
An address on "Science and Electrotechnology" was then given by Dr. Lee A. Du Bridge, President of the Californian Institute of Technology, and the session was brought to a conclusion by an address on "International Economic Co-operation" by Lord Waverley.

Lord Waverley's Review

In his address Lord Waverley reviewed the objects and achievements of the various international instruments which operate through the governments concerned, the most important of which in the economic field were the World Trade Charter, the International Monetary Fund and the World Bank. Although these organizations might not always be used with the maximum of efficiency, without political bias or an eye to particular national self-interest, they had nevertheless played an essential part in securing truly international co-operation as well as a fruitful interchange of ideas, of techniques, and of understanding at the working levels of administration and of industry.

The International Electrotechnical Commission, he said, was the preserve and responsibility, not of Governments, but of technological and industrial interests in all the countries represented. International agreement on standards was, indeed, a matter of hard bargaining and compromise not unlike that which went on in intergovernmental organizations about the level of a tariff or other measures of that kind. The I.E.C. Committees, however, met with common professional aims and basic understandings and common loyalties and human friendship developed over the years. They met to discuss and solve practical problems sustained by objective thinking based on the best available knowledge of natural laws and untrammelled by considerations of a purely theoretical or of a political kind. Those who represented the member countries of the I.E.C. had a great opportunity of bringing the world "into tune."

At the evening banquet the chair was occupied by Mr. R. C. Sogge, president of the U.S. National Committee of the I.E.C.



Present at the meeting of Sub-Committee 3 (Components) of Technical Committee 12 on Radio Communication of the International Electrotechnical Commission were delegates from Belgium, Canada, France, Germany, India, Israel, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom, and the United States. Officers of the Sub-Committee (left to right) on the platform: Mr. L. Van Rooij (Netherlands), Dr. N. A. J. Voorhoeve (Netherlands) and Mr. E. F. Seaman (U.S.A.), chairman. British delegates in front row facing platform: Messrs. R. W. Kersey, G. D. Reynolds and P. D. Canning

The " toastmaster " was Mr. Walter L. Cisler (president, Detroit Edison Company) and among the speakers were Mr. A. C. Monteith (president, American Institute of Electrical Engineers), Mr. D. G. Mitchell (chairman, Board of Sylvania Electrical Products), Dr. H. S. Osborne (president of the I.E.C.) and Dr. H. Tornebohm (president of the I.S.O.).

The proceedings at Philadelphia were remarkable for the intense activity in the technical committees and for the extent of the results achieved. The last I.E.C. meeting in the U.S.A. was in 1926; the extent of that country's participation in the work of the technical committees in Europe has not always been as great as could have been wished. As many committee meetings as possible were arranged for this year to secure full American participation in the technical discussions over the widest field.

In most years a dozen to fifteen meetings of technical committees or sub-committees are held, but on this occasion there were forty-eight such meetings in addition to meetings of the Committee of Action and of the Council. The number of technical sessions totalled about 260.

The way the I.E.C. works can be summarized as follows:

After a draft I.E.C. recommendation (which may be in the form of a specification, test code, vocabulary, list of symbols, etc.) has been fully discussed in one or more meetings of a technical committee, it is circulated to all National Committees under the " six months' rule," under which the National Committees are given six months in which to endorse, or otherwise, the draft for publication as an official I.E.C. recommendation. A majority of four-fifths of all the National Committees must vote in favour of the document before it can be issued. In practice, the votes of the National Committees are often accompanied by technical comments; these are reviewed by the chairman and secretariat of the relevant technical committee or, in some cases, by the technical committee itself, and a modified draft is then circulated to the National Committees for approval under a two months' procedure. If the necessary majority votes in favour of this revised draft, the document goes forward for publication; otherwise it is referred back to the technical committee for further consideration.

As the result of the meetings in Philadelphia, the following documents have been approved for publication:—

Rules for electric traction motors. (Third edition of I.E.C. Publication No. 48).
Rules for electrical equipment installed on motor vehicles.
High-voltage circuit-breakers: rules for temperature-rise.
Porcelain insulators for overhead lines.
Supplement to I.E.C. Publication No. 67, Electronic tubes and valves.

The following documents, which had previously been circulated under the six months' rule, have now been modified and will be circulated for approval under the two months' procedure:—

Paper dielectric capacitors.
Colour code for paper dielectric capacitors.
Rules for testing of paper-insulated lead-covered cables up to 66 kV.
Flameproof enclosures of electrical equipment.
Tubular fluorescent lamps.
Standard Sheets for pre-focus lampholders, P28 and P40.
Ballasts for fluorescent lamps.
Glass insulators for overhead lines.

The following documents which have been under discussion at these and previous meetings have now been approved for circulation under the six months' rule:—

Ceramic dielectric capacitors.
Classification of insulating materials.
Vocabulary: Sections dealing with radiology and electro-biology.
Specification for steam turbines. (Revision of I.E.C. Publication No. 45).
Standard of resistance of aluminium.
Hard-drawn aluminium conductor wire.
Aluminium busbar conductors.
Methods of measurement on F.M. radio receivers.
Safety requirements for television receivers.
Gramophone motors.
Rules for adjustment of voltage (radio receivers) without the aid of tools.
Colour code for ceramic capacitors.
Aluminium electrolytic capacitors.
High-frequency cables (rated impedances and dimensions).
Test methods for volume and surface resistivity of insulating materials.
Tracking test for insulating materials.
High-voltage circuit-breakers: rules for dielectric strength.
Sound recording (disc and magnetic tape).
Tungsten filament lamps having a life of 2,500 hours. (Supplement to I.E.C. Publication No. 64).
Gauges for interchangeability and safety of lamps and holders (types E27 and E40).

Standard sheets for ceramic B22 lamp-caps.
Dimensions of sub-miniature tubes and valves.
Caps for electronic tubes and valves.
Primary cells and batteries.

Committee Meetings

Of the 48 committees which met in Philadelphia, the British Standards Institution provided the secretariat for eight. The following notes draw attention to some of the more important points raised at the meetings of the Technical Committees and Sub-Committees:—

Technical Committee No. 1—Vocabulary. (Chairman: General E. E. Wiener, Belgium.)

This Committee is working on a revision of the 1938 edition of the International Electrotechnical Vocabulary. In Philadelphia detailed consideration was given to the drafts of the sections dealing with electro-chemistry and metallurgy, radiology and electro-biology. The definitions in the vocabulary are to be given in English and French, and it has now been decided that Dutch shall be added to the languages in which the terms are to be stated, the others being German, Spanish, Italian, Polish and Swedish.

Technical Committee No. 2—Rotating Machinery. (Chairman: Mr. C. A. Martin; secretariat: U.K.)

This Committee held a short session to receive a report from Sub-Committee 2C. This report was adopted.

Sub-Committee 2B—Dimensions of Motors. (Chairman: Mr. C. A. Martin, U.K.)

At an informal meeting views were usefully exchanged regarding the experience of American manufacturers and users in relation to standards for motors.

Sub-Committee 2C—Classification of Insulating Materials. (Chairman: Mr. J. H. C. Spinks, U.K.; secretariat: U.K.)

For many years there has been a classification of insulating materials for giving guidance to designers of electrical equipment in selecting materials which will withstand certain temperatures. These classes of materials (O, A, B and C) have become firmly established but do not make adequate provision for some of the newer materials now available. The Sub-Committee has therefore been revising the classification with a view to introducing additional classes. There has, however, been considerable discussion on the whole basis of the classification, some countries being of the opinion that it should be based solely on the results of tests, while others have expressed the view that, pending agreement on the methods of test, a classification on the present lines serves a useful purpose and should include lists of specific materials which, on the basis of experience, can be assigned to the various classes.

General agreement has now been reached that, until such time as further experience has been gained on the evaluation of systems of insulating materials on the basis of tests, the present classification should be extended by the addition of new classes, and that some guidance should be given in an appendix regarding materials which, on the basis of practical experience may be assumed to fall within the various classes. It should be emphasized, however, that this appendix is given for guidance only and should be used with reserve.

A draft classification and appendix along these lines will now be circulated for approval under the six months' rule. Looking to the future, however, a further document will be circulated to the National Committees for study, this being based on proposals submitted by the U.S. National Committee for the test procedure for the evaluation of systems of insulating materials for random-wound machinery. It is hoped that the test procedures described in this document, which have already found considerable acceptance in the U.S.A., will be tried out in other countries in the hope that they can be recognized as international test procedures in the not too distant future.

Dr. P. Dunsheath (U.K.), treasurer; Dr. H. S. Osborne (U.S.A.), president; Mr. P. Ailleret (France); and Dr. H. Sterky (Sweden)

Technical Committee No. 4—Hydraulic Turbines. (Chairman: Dr. Richard Heartz, Canada.)

This Committee is preparing an international code covering rules for acceptance tests for hydraulic turbines. Three methods of measurement were discussed, namely: current meters, Allen Salt velocity, and Gibson (pressure/time). It was agreed that all three methods should be recognized in the international code in conjunction with proper provisions for the application of each method, on the understanding that this implied no restriction as to the inclusion of other methods of water measurement.

There was considerable discussion on the question of tolerances, and it was agreed on a majority vote to specify a plus tolerance only in output (to take into account unavoidable variations in manufacture) and plus and minus tolerances on measured efficiencies (to take into account the inaccuracies inherent in measurements). The manner of application and the amount of these tolerances will be discussed at a later meeting, when consideration will also be given to formulæ for the calculation of windage and friction. A Committee of experts is to be set up to study and correlate all available data on this subject.

Technical Committee No. 5—Steam Turbines. (Chairman: Mr. B. Pochobradsky, U.K.)

This Committee completed the draft of a revision of the I.E.C. specification for steam turbines and went on to consider the revision of the I.E.C. publication dealing with acceptance tests. In the light of the points raised at the meeting, the secretariat (U.S.A.) will now prepare a revised draft for consideration by the National Committees and for subsequent discussion at a future meeting of the I.E.C. Committee.

Technical Committee No. 7—Aluminium. (Chairman: Mr. C. H. E. Ridpath, U.K.)

After discussions extended over many years, agreement has been reached on an international standard of resistance for aluminium, the resistivity value being 1/37 (0·027027) ohm mm^2/m.

The preparation of a specification for annealed aluminium electrical conductor wire was dropped for the present, it being felt that there was no need for a commercial specification. Preliminary agreement was, however, reached on international standards for hard-drawn aluminium conductor wire, aluminium busbar conductors and galvanized steel wire for the cores of steel-reinforced aluminium conductors.

There was some discussion as to whether work should proceed on the preparation of a specification for aluminium alloy wires. In view of the relatively limited use of such

wires and the developments which are now taking place, it was decided to refer the matter to the Committee of Action as one of policy. The Committee of Action subsequently authorized the formation of a Sub-Committee to go ahead with the work, the secretariat being entrusted to one of the countries particularly interested in the use of aluminium alloy wires.

Technical Committee No. 8—Standard Voltages, Current Ratings and Frequencies. (Chairman: Mr. H. Puppikofer, Switzerland.)

Amongst the several items discussed were definitions of the terms "rated equipment voltage" and "maximum design voltage." It was decided to send a questionnaire to the chairmen of other technical committees to obtain information on the voltages intended for designating equipment. A table of standard frequencies for different applications was drawn up for circulation to the National Committees for comment.

Technical Committee No. 9—Electric Traction Equipment. (Chairman: Dr. Marco Semenza, Italy.)

The subjects discussed included rules for auxiliary machines on motor vehicles and for the electrical transmission of vehicles with diesel engines. Preliminary drafts were discussed and revised drafts will now be prepared by the secretariat for consideration by the National Committees.

Technical Committee No. 12—Radio-communication. (Chairman: Mr. P. Besson, France.)

A short session of this Technical Committee was held to receive reports from its five Sub-Committees, all of whom held meetings in Philadelphia. Eight documents were approved for circulation under the six months' rule and two for circulation under the two months' procedure. It was decided to set up a Sub-Committee to prepare rules for radio transmitters.

A proposal that the Sub-Committee on Components should be given the status of a separate Technical Committee and that this new Technical Committee should also take over the work at present being done by the Sub-Committees dealing with h.f. cables and with crystals was referred to the Committee of Action. Some delegates to the Committee of Action considered that all work in the field of telecommunications and electronics should be reorganized in accordance with a carefully co-ordinated plan. This was generally agreed, but pending the drafting of such a plan it was agreed that a new technical committee on components should be set up.

Technical Committee No. 15—Insulating Materials. (Chairman: Dr. R. Vieweg, Germany.)

This Committee held a meeting jointly with its Sub-Committee of experts, when a reorganization of the programme of work was discussed. It was agreed that in future a committee of experts should be formed on an individual rather than on a national basis and should act as a steering committee to co-ordinate the activities of several working groups, each of which would deal with a specific task relating to methods of test for insulating materials.

Technical Committee No. 17—Switchgear. (Chairman: Mr. G. de Zoeten, Netherlands.)

A short session of this Committee was held to receive reports from its two Sub-Committees. These reports were adopted.

Sub-Committee No. 17A—High-Voltage Switchgear and Control-gear. (Chairman: Mr. G. de Zoeten, Netherlands.)

The U.S. National Committee having voted against the adoption of part of the specification for high-voltage circuit-breakers, endeavours were made to bridge the gap between the views of the American Committee and that of other National Committees. As this was not found possible, it was decided to recommend to the Committee of Action that the document should be published as it stands, and that the matter should be re-examined in a few years' time, when a complete second edition of the specification will be prepared.

The Sub-Committee also considered the standardization of rated breaking capacity in relation to rated voltage and rated normal current. Provisional agreement was reached and the matter will be further considered at the next meeting. Consideration was also given to rules for the selection and maintenance of high-voltage circuit-breakers.

Sub-Committee 17B—Low-voltage Switchgear. (Chairman: Mr. D. E. Lambert, U.K.)

This was the first meeting of the Sub-Committee and consideration was given to a draft specification prepared by the Secretariat (France). Owing to the length of the document it could not be reviewed in great detail, but a modified scope and arrangement of the draft was agreed upon. A number of technical points arose during the discussion and a second draft will now be prepared by the secretariat for consideration at the next meeting.

Technical Committee No. 18—Electrical Installations in Ships. (Chairman: Mr. G. O. Watson, U.K.)

This Committee had a very long agenda and the meetings occupied twelve sessions. The Committee is working on a comprehensive code which contains sections dealing with definitions, symbols, general requirements and conditions, earthing, diversity factors, d.c. systems, a.c. systems, switchgear, distribution, cables, transformers, machines, control gear, accessories, lighting, accumulators, heating and cooking, internal communications, radio interference, lightning arrestors, tankers, electrical propulsion, the 1948 convention, and trials.

Although this was the first meeting of the full Committee since 1948, there has been considerable activity in numerous Sub-Committees, with the result that rapid progress was made in Philadelphia. It is hoped that revised draft of the whole code will be ready for fina Consideration next year.

Technical Committee No. 20—Electric Cables. (Chairman: Mr. P. V. Hunter, U.K.; secretariat: U.K.)

For several years past discussions have taken place on a draft specification for tests on impregnated paper-insulated lead-covered cables of the solid type for voltages of 10 kV up to 66 kV. As the result of the meeting held in Yugoslavia last year a draft specification was circulated to the National Committees for approval under the six months' rule, and although the four-fifths majority necessary for the approval of the document had been obtained, a few countries, including the U.K. and the U.S.A., had voted against the adoption of the draft. At the meeting in Philadelphia the objections lodged by these two National Committees were considered, with the result that modifications to the draft have been made and a revised edition will now be circulated under the two months' procedure.

In many respects practice in the U.S.A. differs from that in Europe and the draft specification as modified still differs from the current American specification. It is hoped, however, that subject to a statement to this effect being included, the draft will now be generally acceptable for publication as an I.E.C. recommendation.

A draft specification for oil-filled paper-insulated lead-covered cables for voltages up to 275 kV is still under consideration. This draft is based on a report drawn up a few years ago by a Committee of C.I.G.R.E.

Technical Committee No. 22—Power Converting Equipment. (Chairman: Mr. L. W. Morton, U.S.A.)

A short session of this Committee was held to receive a report from Sub-Committee 22–1 on rectifiers.

Sub-Committee 22–1—Rectifiers. (Chairman: Mr. C. A. Ehrensperger, Switzerland.)

The U.S. National Committee having submitted some rather drastic comments on the draft specification for mercury arc rectifiers, discussion in Philadelphia centred around the differences of opinion on the two sides of the Atlantic on the following points: rectifier rating classes; ambient temperature to which temperature-rises should be referred; transformer temperature-rise; and voltages for flash tests.

On all these points the American Committee had proposed that no specific figures should be included in the specification. Compromise figures were, however, finally agreed upon which, although involving the introduction of a large number of different classes, met the requirements of all National Committees. On this basis a revision of the draft specification was agreed upon which, although in the view of the British delegation would not result in the best specification, allowed work on the specification to go forward with the support of all concerned.

Technical Committee 24—Electric and Magnetic Magnitudes and Units. (Chairman: Dr. M. K. Landolt, Switzerland.)

A meeting of this Committee was held in conjunction with a meeting of its Sub-Committee of Experts. Several resolutions were adopted dealing with such matters as the following: the use of the term " Tesla " for the unit of magnetic induction in the M.K.S. System; rationalization of electro-magnetic field equations; sign of reactive power to be positive for the reactive power absorbed when the load is inductive; revision of certain definitions in the second edition of the International Vocabulary; preparation of a document containing all the decisions taken by Committee No. 24 since the formation of the I.E.C.

Technical Committee No. 25—Letter Symbols. (Chairman: Dr. M. K. Landolt, Switzerland.)

Work was commenced on a revision of I.E.C. Publication 27, International Letter Symbols used in connection with electricity. It was agreed that the new (4th) edition should be greatly expanded in regard to material of interest in the electronics and telecommunications fields.

Technical Committee No. 29—Electro-Acoustics. (Chairman: Professor W. Furrer, Switzerland.)

During the past year or two there has been considerable discussion regarding the relative scopes and programmes of I.E.C. Committee No. 29 and I.S.O. Technical Committee 43, Acoustics. Some countries (and in particular the U.S.A.) had urged that all work relating to standardization in the field of acoustics should be done by a single international organization rather than being divided between the I.E.C. and the I.S.O. This viewpoint has not been universally accepted and I.E.C. Committee 29 decided in Philadelphia that its scope should include the preparation of international recommendations for standardization in electro-acoustics, including generating, transducing, recording and reproducing of sound (including infra-sound and ultra-sound) and all such subjects in acoustics as might be allotted to it through the Committee of Action of the I.E.C. in agreement with the Council of the I.S.O. It was further agreed that the work of this Committee and that of I.S.O. Committee 43 should be co-ordinated by a steering committee to be composed of the chairmen and secretariats of the two committees. In order to avoid excessive travelling, the two committees should always meet concurrently or in close succession in the same vicinity, unless otherwise decided by the steering committee.

Consideration was then given to a document dealing with the characteristics to be specified for the application of audio-apparatus, and it was agreed that where necessary the units should be expressed in both the M.K.S. and C.G.S. systems.

The subject of disc-recording and magnetic tape recording was also discussed and there was a substantial measure of agreement over a wide field, which, it is hoped, can be embodied in a document for early ratification.

A specification for hearing aids was also considered and discussion on this subject will be continued at the next meeting.

(To be continued)

I.E.E. Benevolent Fund

WE have received from the Incorporated Benevolent Fund of the Institution of Electrical Engineers a copy of the annual report of the Court of Governors. On 30th June last the capital of the general fund stood at £138,143 (as compared with £116,430 for the previous year) and of " The Chesters " Trust, £16,184 (£15,673), making a total of £154,327 (£132,103).

The income for the year from all sources for the Fund and " The Chesters " Trust amounted to £15,616 (£14,477). The income from subscriptions increased from £12,155 to £12,427. This amount is, however, insufficient to cover the expenditure, and the Court appeals urgently to the two-thirds of the membership who do not at present subscribe. A donation of 5s from each of these members would enable the Court to increase the amount of grants to beneficiaries. Although the standard of grants has been maintained, expenditure has shown an increase owing to the extension of " The Chesters " estate, the maintenance of which now costs approximately £2,000 per annum. To offset this, grants to beneficiaries who become residents on the estate are decreased or in some cases discontinued, and this has resulted in a saving of £750 a year.

During the year the Fund has benefited by £22,510 by the following legacies: Mr. H. W. Hartridge, £10,914; Mr. B. E. Bolton, £9,179; Mr. F. J. N. Haward, £1,552; Mr. W. A. Wilson, £500; Mr. K. S. Geipel, £200; Sir Holbrook Gaskell, £100; Mr. W. J. Wayte, £50; and Mr. R. B. Dennis, £15.

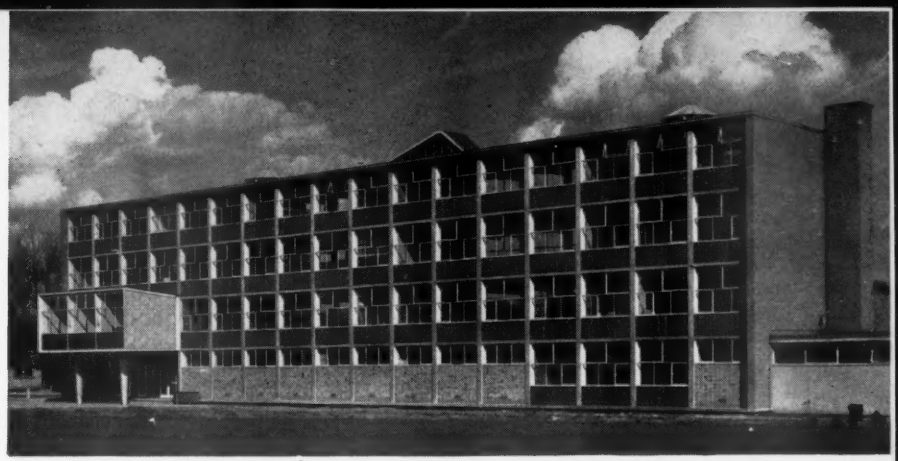
Grants were made to 126 beneficiaries, and in assisting these persons the Fund also gave support to 101 dependants. The amount of these grants was £8,845 and the average amount distributed per beneficiary during the year was approximately £70. The Court reminds members of the benefits derived from the execution of deeds of covenant, which enable the Fund to recover income tax, provided a member agrees to subscribe a fixed amount per annum for a minimum period of seven years.

In addition to the residential homes at West Worthing and Englefield Green, in which three of the Fund's beneficiaries are accommodated, the Crossways Trust has acquired a further property at Brighton to which the Fund was invited to subscribe in units of £1,000, each unit giving the right to nominate a person for residence in the home. The Brighton home provides accommodation for 51 residents, infirm and able-bodied in equal proportions. Two units were subscribed and two of the Fund's beneficiaries have availed themselves of the opportunity of taking up residence in the Brighton home.

The total amount received by the Homes Fund in subscriptions and donations from its inception to 30th June last was £33,873. On 30th June the capital account of the Wilde Fund stood at £3,048, all of which is invested and brings in an annual income of about £93. On the same date the Lord Hirst Fund comprised: capital account investments, £11,543, and income accounts investments, £2,698; these produce an annual income of about £421.

N.E. ESSEX TECHNICAL COLLEGE

New Engineering Block Opened



THE first section of the new North East Essex Technical College, Colchester, officially opened by the Minister of Education (Miss Florence Horsbrugh, C.B.E., M.P.) on 23rd September, comprises a four-storey building of drawing offices and laboratories and an extensive single-storey block of laboratories and workshops, the whole occupying an area of 37,000 sq ft.

Catering for the further educational needs of the whole of North East Essex, the college provides a wide range of courses, including the inter B.Sc., the Ordinary and Higher National Certificates in electrical and mechanical engineering, City and Guilds electrical installation work, radio servicing, automobile engineering, fitting, welding, machine shop practice and building trade subjects. The second section, scheduled to be built in 1956, will eventually house the science, commerce and art departments.

The total installed electrical plant capacity is about 350 kVA and the Eastern Electricity Board has provided a separate feeder from its nearby substation. The three-phase, four-wire 415/240 V supply is controlled at the intake position by a 750 A t.p. and n. air circuit breaker (Dorman & Smith), having a rupturing capacity of 25 MVA which is connected on the outgoing side to a 750 V busbar chamber. Power and lighting mains and lighting sub-circuit wiring are carried out with Henley's v.r.i. cable drawn into steel screwed conduits. Considerable use has been made of cable trunking to avoid multiple conduit runs and to facilitate extensions. Over 700 Benjamin " Saaflux " lighting units are installed for the general lighting.

In the woodworking and metalworking machine shops an overhead busbar system (English Electric) has been adopted, controlled by an automatic oil immersed contactor. A number of emergency stop buttons are provided around the walls. In the workshop block the use of pre-cast concrete roof units presented difficulties in fixing conduits, and the Enfield grid suspension system has therefore been used for the whole of the lighting installation.

Equipment in the advanced electrical engineering laboratory includes a 7 kW motor generator set and a 10 kW Nevelin glass bulb demonstration type rectifier, each affording a 110 V d.c. supply, and a 20 kVA Ferranti three-phase transformer providing a 110 V three-phase, four-wire supply. The output from these machines is taken directly to separate panels on a main laboratory control panel constructed by Varilectric, Ltd., using their fuse switch units and Chilton circuit breakers. From the main control panel the 110 V a.c. and d.c. supplies can be distributed as desired to the various machines. Provision has been made for the output of generators and alternators to be fed back to the panel for paralleling and synchronizing as required. Bench outlets giving 110 V d.c. or 110/65 V a.c. are disposed along the sides of the laboratory for bench experiments. To avoid trailing leads, a six-wire ring circuit has been included with link terminal panels at intervals around the laboratory.

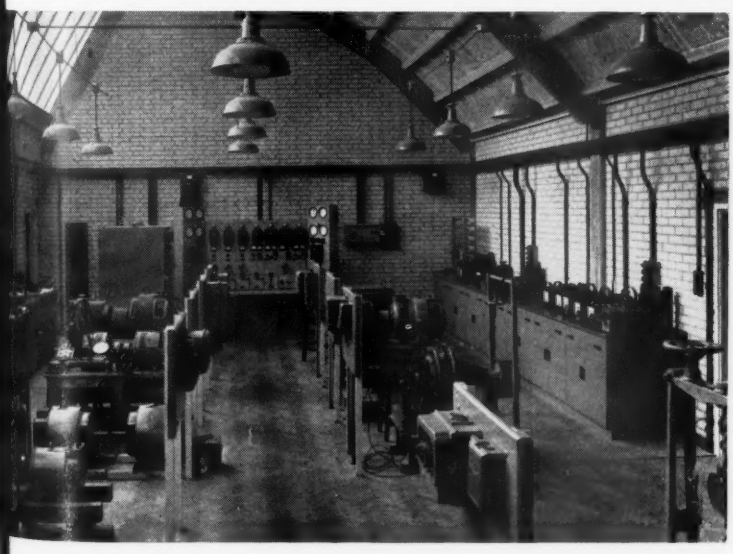
The elementary electrical engineering laboratory is used for experiments up to S.2 level and two motor generator sets are provided for experiments on machine characteristics. The a.c./d.c. bench outlets in this laboratory are supplied from a specially designed cubicle type " Crypton " transformer and dryplate rectifier unit giving outputs of 12 and 24 V d.c., 30, 50 and 110 V a.c., with a separate variable d.c. output for battery charging.

The radio and electronics laboratory is well equipped with modern electronic apparatus, and in the electrical installation shop facilities are provided for practical wiring work, cable jointing and the testing and repair of electric cookers, water heaters, motors, etc. A cross section of many kinds of modern electrical apparatus including equipment for high frequency heating and welding, an electronic engine analyser and electric furnaces is included in other workshops.

" Copperad " unit heaters are installed for the heating and ventilation of the principal laboratories and workshops and Woods of Colchester have provided many fans.

The whole of the electrical lighting, power, fire alarms, clocks, laboratory equipment and machine installations were carried out by a local firm, M.G. Installations, Ltd. Consulting engineers for the electrical and mechanical services were W. S. Atkins and Partners, who with the principal, Dr. G. O. Stephens, vice-principal, Mr. A. Rigby, and the staff of the engineering department were responsible for the design and layout of laboratories and equipment.

We are indebted to the lecturer in electrical engineering, Mr. N. D. Cubitt, Graduate I.E.E., for his assistance in the preparation of this article.



In the advanced electrical engineering laboratory a wide range of d.c. and a.c. machines is installed

Area Boards' Reports

Return to Normal Brings Record Expansion

NEW records for sales, consumers connected and work completed were established by a number of Electricity Boards last year. Details of these are contained in the reports of the individual Boards,* amplifying the information given in that of the British Electricity Authority (summarized in our last issue).

The highest rate of increase in electricity sales was achieved by the South Western Board (10·1 per cent), which connected a greater number of new consumers than in any previous year (27,338), many of them in rural areas. In spite of the extra work entailed there was a further saving in office staff; in the past two years the number of employees has been reduced by no fewer than 639 including 319 office staff. Similar administrative economies are reported by other Boards. Thus the South Eastern Board, which also connected more new consumers than in any previous year (35,500), cut its staff by another 98 and there was a net decline of 49 in the Eastern Board's managerial and clerical, etc., staff after allowing for certain increases in technical and commercial staff required to carry out the large programme of work on which the Board has embarked.

Amalgamation of Districts has also produced economies. In the London Board's report reference is made to the experimental two-tier organization under which the South Western Sub-Area has been disbanded. The main problem has been to provide suitable accommodation for the two enlarged Districts; at the end of the year this difficulty was being progressively overcome and the Districts were functioning satisfactorily. Mechanized billing in the South Western Board's Area is now concentrated at Plymouth and last year the overall meter reading, billing and collection costs were reduced by £27,000, despite salary increases. A further consequence was speedier collection of consumers' accounts, substantially reducing outstanding debts. The Board's report points out that over the past two years the reduction of capital employed in stock and outstanding consumers' accounts has totalled £2,000,000, representing interest charges of £70,000 a year. The year's capital investment programme of over £2,350,000 was thus financed virtually without additional borrowing.

All the Boards report increased electrical apparatus sales and installation work. The Eastern Board had the highest aggregate turnover, £5,309,185, producing a surplus of £137,851. Special attention was directed to water heating development. The next largest increase in sales and contracting work was achieved by the North Western Board, whose turnover on this account rose by £837,853 (36 per cent) to £5,151,249. Out of the North Eastern Board's turnover of £1,088,137, sales of electrical apparatus amounted to £719,665, an increase of over 50 per cent. The greater part of this expansion was in hire-purchase sales.

Few of the Boards have yet restarted simple hire schemes. One exception is the East Midlands Board in whose Area the number of hired cookers on circuit rose last year by 7,594 to a total of 151,062 and wash boilers by 7,840 to 42,297. To encourage the expansion of the useful water heating load the Board decided to introduce a standard scheme for the hire of immersion heaters and in eleven months 12,371 installations were completed, with a potential consumption of 15 million kWh per annum. The quarterly rental under the scheme is 6s 6d for the heater alone or 8s 8d with installation. In the London Area the Consultative Council indicated to the Board that it attached great importance to simple hire. While expressing its agreement with that view the Board replied that the capital available would not permit the introduction of such schemes at present.

Although higher coal prices added substantially to bulk supply costs (see table), these were partially absorbed by internal economies. Retail tariffs in London have not been changed for two years. The South Eastern Board completed the standardization of domestic tariffs last year but otherwise there was no important change, while in the Southern Area the only alteration was a modification of the standard commercial block tariff. Increases were introduced by the South Western, Eastern, Midlands, North Eastern and South West Scotland Boards. New standard tariffs were brought into operation by the East Midlands, Merseyside and North Wales, Yorkshire and South Wales Boards. The generally mild winter with a short cold spell resulted in most Boards having a load factor inferior to that of 1952–53. The simultaneous maximum demand in each case occurred between 29th January and 11th February, nine Boards experiencing their m.d. in the morning, the South Western Board at 12.30 p.m. and the London, South Eastern and Eastern Boards between 5.30 and 6.30 p.m. Further points from the Boards' reports are summarized below.

SIMULTANEOUS MAXIMUM DEMAND, LOAD FACTOR AND FUEL COSTS

Board	Max. demand, MW°		Load factor, per cent		Bulk supply tariff fuel cost per ton		Running cost per kWh	
	1952-53	1953-54	1952-53	1953-54	1952-53	1953-54	1952-53	1953-54
							d	d
London	1,544	1,745	41·0	37·5	73/2	79/5	0·6254	0·6779
South Eastern	781	972	46·8	40·1	74/10	78/10	0·6394	0·6730
Southern	916	1,080	46·6	42·4	72/10	78/2	0·6226	0·6674
South Western	466	544	44·1	41·2	70/8	75/3	0·6044	0·6429
Eastern	1,252	1,487	47·5	42·5	73/10	79/11	0·6310	0·6821
East Midlands	1,109	1,239	46·0	44·1	54/3	57/7	0·4665	0·4945
Midlands	1,495	1,681	45·7	43·1	60/5	63/11	0·5183	0·5477
South Wales	642	709	60·2	58·6	51/4	55/6	0·4420	0·4770
Merseyside and N. Wales ...	743	834	51·4	48·9	64/1	68/4	0·5491	0·5848
Yorkshire	1,412	1,532	47·3	46·2	53/7	56/1	0·4609	0·4819
North Eastern	771	833	52·3	51·4	59/4	64/4	0·5092	0·5512
North Western	1,641	1,781	44·4	44·5	60/4	64/0	0·5176	0·5484
S.E. Scotland	303	337	46·5	45·4	61/6	64/5	0·5274	0·5519
S.W. Scotland	769	811	44·5	45·1	67/2	71/6	0·5750	0·6114

° Net purchases from Central Authority and other Area Boards.

London.—More construction and extension work was completed than in any previous year. Capital expenditure amounted to £7,315,825, making nearly £33 million since the Board was established. Expenditure on the replacement of non-standard-voltage consumers' apparatus exceeded £300,000. Six new bulk supply substations were placed in service. No major breakdowns occurred but there were five bulk supply failures affecting from 20,000 to 95,000 consumers for periods from 5 to 100 minutes. Special testing work was carried out on the thermal characteristics of soils, cable temperatures under different conditions of loading and, in conjunction with manufacturers, on a valve-type live line detector.

South Eastern.—The Board established new records by laying 488 miles of mains and commissioning 693 substations. Including transmission, 1,734 projects of extension and reinforcement were approved. Capital expenditure, at £3,586,000, exceeded the allocation by 4·5 per cent. Though for the second successive year the simultaneous maximum demand occurred on a Monday evening, the Board is prone to record its m.d. on a Sunday and con-

* H.M. Stationery Office, price 1s 6d to 2s 6d.

sequently it welcomes the freeing of Sunday loads from the kW charge, but points out that a five-year guarantee of this concession is the minimum that would enable the Board to proceed with accelerated development of Sunday loads. Last year the 4s rise in the price of coal added £400,000 to the Board's costs and the payment in lieu of local rates increased by £6,000 to £489,000.

Southern.—Capital expenditure of approximately £5,964,000 was authorized, of which some £5,677,000 was for engineering works. The removal of restrictions on new commitments for supplies enabled the Board to make a start on a number of schemes which had been held up for reasons of national policy. During the year 1,092 farms were connected and a supply was made available for the first time to 23 villages and hamlets. Two-thirds of the farms in the Area are now served.

South Western.—By connecting 1,110 farms during the year the Board has now doubled the number supplied six years ago. A grant of £250,000 made by the B.E.A. in respect of the rural electrification undertaken by the Board in the five years up to 31st March, 1953 (in view of the undeveloped state of the Area at vesting day, action to expand rural supplies had to be taken in advance of normal financial possibilities), has enabled the Board to clear the accumulated deficit. A new system of financing rural extensions has been adopted under which standard "rural development contributions," according to the type and size of premises, take the place of line rentals. Turnover from the sale of appliances and wiring last year reached the record level of £1,919,017, an increase of £305,397. More cookers and water heaters were installed than in any previous year.

Eastern.—Capital work, amounting to £6,903,413, included the provision of 965 new substations and over 900 miles of new mains and cables. More than 10,000 new public lighting points were connected. Supplies were made available to 156 additional villages and hamlets and 1,196 farms. Under the Board's second five-year scheme it is planned to supply 50,000 rural premises (including 6,000 farms) by the end of March, 1958. By 1962 or 1963 it is expected that electrification of the Area will be substantially completed, covering about 90 per cent of rural premises. Last year lightning was responsible for over a third of all faults on the h.v. overhead lines; a single storm caused more than 100 faults.

East Midlands.—A total of 991 miles of h.v. and l.v. mains and cables was commissioned, an increase of 45 per cent, and transformers installed numbered 1,269. Approval was given to 29 major development schemes involving the construction of over 50 miles of 33 kV line and five h.v. substations. Capital expenditure totalled £6,253,555. New and additional supplies to 15 collieries, totalling 60,000 h.p., were negotiated. Farms connected numbered 1,434 (33 per cent increase). Traction sales declined through the Notts & Derby Traction Co. ceasing to operate trolley-buses. A bulk supply of 29·2 million kWh generated from blast-furnace gas was received from the Sheepbridge Co., and the Stanton Ironworks Co. is also to afford a supply from waste heat generation. The report notes that at the time of the national m.d. (2nd February, 8.30 a.m.) the Board's demand was 56,000 kW less than that at which it has been charged.

Midlands.—Capital expenditure on new mains, services and machinery, etc., totalled £5,882,813. Supplies to more than 12,000 consumers were standardized; since 1948 the number of d.c. consumers has been reduced from 73,815 to 23,287. Although the growth of the undertaking has meant an increase in employees the number at the end of the year was equal to only one for every 478,000 kWh sold or £2,574 worth of turnover against 435,000 kWh or £1,941 in 1948. Subject to fitness and willingness, employees reaching the retiring age are being retained in service.

South Wales.—The size of the Board's construction programme is shown by the fact that the 503 miles of h.v. mains laid during the year represented no less than 15 per cent of the total mileage in commission at 31st March, 1953, and exceeded the 1952–53 construction by 88 per cent. New substations commissioned numbered 1,376 against 545 in the previous year. Supplies to 6,574 consumers were changed over, leaving 29,940 to be dealt with. Capital expenditure, at £4,050,400, compared with £2,589,345 in 1952–53. Two and a half times as many farms were connected (951). Tariff standardization was completed.

Merseyside and North Wales.—Supplies were afforded to large new industrial developments, housing schemes (38 major projects were in hand at the end of the year) and rural areas. Capital expenditure last year totalled £3,539,907. The Board continued to develop a comprehensive service for consumers, including fuse repairs by day and night and the giving of advice on the installation of appliances and wiring. Additional service centres were acquired, making 60 in all. The experimental use of v.h.f. radio was not extended because of uncertainty over the availability of frequencies.

Yorkshire.—Schemes approved for the reinforcement and extension of the distribution system numbered 4,124, the estimated cost being £10 million. Gross capital expenditure last year was £5,925,001 (against £4,863,914). Additional industrial load totalled 61,214 kW. The increased rate of reinforcement was insufficient to prevent overloading, 21 primary substations being loaded to 30 per cent or more beyond their firm capacities. In conjunction with E.R.A. a surge recorder was installed at one of the 66 kV substations. Extended trials of the use of lightning arrestors on 11 kV rural lines were initiated.

North Eastern.—Electrification of colliery winding plant and supplies to Tees-Side steelworks have added considerably to the industrial load. Altogether new and additional industrial supplies last year totalled 24,000 kW and arrangements were made for a further 63,000 kW. The first part of the Board's seven-stage plan of development in urban areas was completed and 9,000 existing houses were connected. In all, 36,066 additional domestic premises were supplied, an increase of 54 per cent on the previous year. Reconstruction work was carried out on former N.C.B. networks and 2,100 consumers were transferred to the Board; a further five networks to be taken over will affect 7,300 consumers.

North Western.—Under the scheme introduced in 1952 whereby consumers can buy 2s 6d stamps for the payment of their accounts more than a million stamps have been sold and at the end of last year the sales averaged £3,000 a week. It is reported that discussions with local authorities to ensure that tenants of new estates shall have freedom of choice with regard to cooking appliances have on the whole been successful, though in some cases the equipment is still predetermined. About 70 per cent of the farms in the Area are now served. Among schemes planned is one for approximately 100 sq miles at Ivegill, Cumberland, which will cost some £256,000, for supplying 400 consumers. Capital expenditure last year aggregated £6,181,000, a record amount.

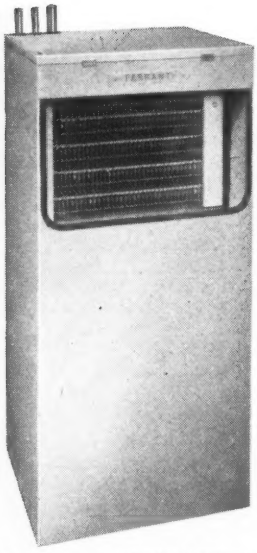
South East Scotland.—Four major floor warming installations with a total off-peak load of 1,018 kW were connected and negotiations were completed for installations with an aggregate load of 2,388 kW in nine other large buildings, which will also use electricity for off-peak water heating. The Board's contract maintenance scheme for domestic appliances is being widely used. Radio communication, besides helping to speed up supply restoration, has improved consumer service. In the mainly rural Southern Sub-Area, where only 30 per cent of the farms are connected (against 43 per cent in the whole Area) it is planned to spend £167,000 next year. A hire scheme for cookers, at first restricted to Council houses, has now been extended to all domestic consumers.

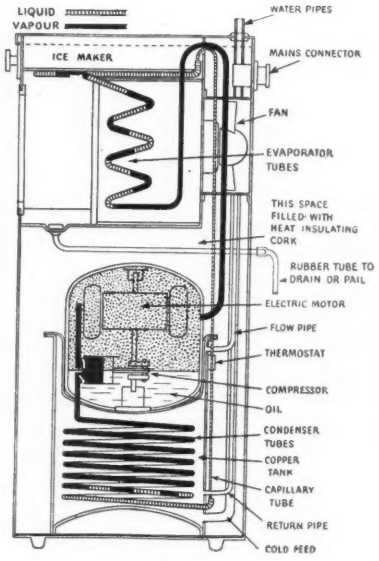
South West Scotland.—At vesting date 24,103 consumers were receiving d.c. supplies; now 360 remain to be changed over and this work will be completed in 1954–55. Apart from these, 4,873 consumers are still supplied at non-

standard voltages. In six years over £775,000 has been spent on changing consumers' apparatus, the whole of which has been met from revenue, and expenditure of £300,000 is likely to be incurred this year. In furtherance of its policy of reducing peak loads the Board offers reduced terms to consumers for whom the restricted-hour tariff is not suitable; 223 cases of off-peak supplies with loads totalling 11,200 kW were approved last year and supplies were given under the restricted-hour tariff to 332 consumers with loads aggregating 8,175 kW. Arrangements were made for a fourth new grid supply point, estimated to cost £853,000, for reinforcing the Glasgow network. The Board has introduced a hire scheme, primarily for the replacement of cookers and wash-boilers on hire under pre-vesting date agreements.

Domestic Heat Pump

Demonstration of Ferranti Equipment in London





The Ferranti "Fridge-Heater" is a neat, compact equipment suitable for installation in the larder. Right: Operation of the equipment embraces the refrigerator principle of the absorption of heat from a chamber (larder) and the transfer of the heat through a suitable medium for a particular purpose (water to give a hot-water supply)

WE recently saw demonstrated in London by Ferranti, Ltd., "theFridge-Heater" which is now in an advanced stage of development and which the company hopes to place on the market in the fairly near future. The "Fridge-Heater" is really a heat pump in suitable form for the purpose of cooling the larder and providing a hot water service in the home. The demonstration equipment was realistically displayed with the "Fridge-Heater" in a specially constructed larder adjacent to which was a hot water storage tank serving a wash basin below. The operation of the equipment embraces the refrigerator principle of the absorption of heat from the air and other contents of a chamber (in this case the larder) and the transfer of the heat through a suitable medium for a particular service (i.e., water to give a hot-water supply).

When hot water is drawn off, cold water is automatically fed into the "Fridge-Heater" to replace it. The heat pump is then thermostatically switched on. The heat is transferred to the water by a special vapour which is continuously circulated in the machine, condensing to a liquid in a coil in the water tank. The liquid is then reduced in pressure and temperature by its passage through a capillary tube and passed into the tubes of the evaporator in the top part of the machine. The larder air is blown over these tubes by a fan, causing the comparatively cool liquid to evaporate. This cools the larder air and condenses the moisture in the air with consequent cleansing. The vapour from the evaporator is then drawn into the compressor and recompressed to a pressure at which it is hot enough to be condensed by the water surrounding the condensing coil. Raising the temperature of the water in the tank is a cumulative process which continues until the temperature is 140 deg F when the thermostat switches the pump off. The amount of heat given up by the vapour on its condensation is three times greater than the amount of heat (supplied as electricity) required to drive the compressor. And there are facilities for making ice. Switching to "ice" stops the fan which reduces the temperature at which the evaporation process occurs to below the freezing point of water.

When the machine is making ice it consumes rather more electricity for every gallon of water heated and the water is not heated so quickly. The moisture extracted from the air collects in the drip tray and can be drained off. Average summer and winter outputs of the equipment are, respectively, 4,200 B.Th.U. and 2,400 B.Th.U., i.e., about 5 gal/hr and 2·5 gal/hr. The mean input is 400 W.

Thermionic Valve Jubilee

IN connection with the celebration of the jubilee of the invention of the thermionic valve by Sir Ambrose Fleming on 16th November, 1904, a conversazione will be held in the Electrical Engineering Department of University College, London, when a plaque commemorating the occasion will be unveiled by the Lord President of the Council. In addition to exhibits and documents relating to Sir Ambrose Fleming's work while professor of electrical engineering at the College, examples of recent researches will be on view. Admission to the conversazione, which will extend over the three days 16th, 17th and 18th November, will be by invitation ticket only. A limited number of tickets for the 17th is available on application, and senior engineers or members of the radio industry who would like to visit the exhibition at the College, which will be open from 3 p.m. to 10 p.m., should apply to the assistant secretary, University College, Gower Street, London, W.C.1.

VIEWS on the NEWS

By REFLECTOR

ENDEAVOURS by some Electricity Boards to persuade consumers to purchase appliances which they have been hiring for very many years have not proved uniformly successful in spite of the low price demanded for the equipment. The consumers know, of course, that ancient appliances are likely to need costly repairs and they prefer that these should be done for nothing by the Boards. In fact it would probably pay the latter to give them to the consumers and wash their hands of any further responsibility. That is what is being done in some cases, I believe. At any rate in the Sheffield Sub-Area consumers who have been hiring electric fires have been told that these fires are now their own property and the supply authority will cease to maintain them. As, according to the Sheffield *Star*, the average rental for fires is 1s 9d a quarter it seems to me that the Board is well rid of them.

* * *

It is always difficult to justify to consumers the method of charging for electricity on the floor-area basis. Recently the West Midlands Area of the National Chamber of Trade protested to the Midlands Electricity Board about this method of assessing the fixed charge. Mr. D. P. Sayers, deputy chairman of the Board, attended a meeting, with the Board's deputy chief commercial officer (Mr. G. W. Abbott), and tried to convince the protesters of the reasonability of the system. A report published in the *Stafford Advertiser* seems to indicate that he was not altogether successful. One of his audience asked: "Does tobacco cost more because a man smokes a big pipe?" Mr. Sayers might have replied that although the price of tobacco was the same for every size of pipe it was probable that the large pipe cost more.

* * *

In commenting upon the B.E.A.'s 1953–54 report *The Times* says that "in an important sense the price of electrical power remains too low." This view is based on the contentions that the Authority and the Electricity Boards are making insufficient provision for depreciation and providing too little from revenue for capital purposes. *The Times* goes on to say that "nationalized electricity continues to lean far too heavily on the public's savings." Surely cheap electricity is a saving to the public. The implication seems to me to be that there is a "financial" public and a "consumer" public and that the one is somehow being robbed for the other's benefit. Strict orthodoxy in accountancy (if this is orthodox) is not the only national consideration.

* * *

A correspondent has sent me a cutting from the *News Chronicle* which contains a description of a device to take the place or augment the effect of an alarm clock. It comprises a mercury switch arrangement which is actuated by alarm clock mechanism to switch on a light at the required time. The inventor says that a flex connected with the switch "runs to the electric light, where its two ends are joined to a break in the circuit." My correspondent's comment is:—"The need for continued presentation of electrical safety by supply authorities, manufacturers, E.A.W., E.D.A. and E.C.A., is only too obvious."

* * *

A *News Chronicle* reader boasts that her sister has a 25 W electric lamp fitted in 1932 which still gives a very good light, and another claims that she has two lamps which have been in use for 22 years. It seems that 1932 must have been a vintage year for lamps; newspaper correspondents generally mention brevity of life rather than longevity. Anyway all the life-efficiency curves which I have seen run off the chart after a much shorter period than this. These lamps should be secured by the makers for their museums.

* * *

According to the *Star*, the Eastern Electricity Board has told the Dunmow (Essex) Council that it is unable to place its lines underground. But, it is said, by way of consolation the Board has agreed to paint the poles any colour the Council wants and has also offered to carry out some "tidying-up."

* * *

Under the heading "Manhole Starts to Boil," the *Manchester Evening News* reports that clouds of steam were seen to be issuing from a manhole at Altrincham.

> "The cause was a faulty electricity cable, working as a super immersion heater and boiling gallons of water used to seal the cable junction-box."

This should teach the Electricity Board to use the more orthodox compounds for this purpose.

* * *

Reference was made in the *Electrical Review* of 11th October, 1884, to methods of regulating the light from individual incandescent lamps on a circuit. The most successful device up to that date was illustrated and described; it was invented by E. L. Roussy, who inaugurated electric lighting in Switzerland. It was stated that:—

> "Mr. Roussy places inside the lampholder a small hollow cylinder, made of glass or some other insulating substance, and filled with carbon powder. This powder is put in contact with one of the poles of the lamp, in order that the electric current must pass through it before getting to the lamp. A screw enables one to compress the powder more or less in its receptacle. If a strong pressure is exerted upon the powder it will form a compact conductor, letting the current pass to the lamp without impediment. But if the regulating button is unscrewed the electric current causes an automatic separation of the compressed powder, and the more this becomes loose the greater will be the resistance to the current and the less the lamp will glow."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Colonel G. G. Mallinson, M.I.E.E., manager of the Newcastle branch of Johnson & Phillips, Ltd., retired on 30th September. He will continue to serve the company in a consultative capacity. Col. Mallinson joined J. & P. in 1925 as branch engineer and was later appointed a director of the former

Col. G. G. Mallinson

Mr. A. C. Bryant

Westmorland & District Electricity Supply Co. He served with distinction in both world wars (Legion of Honour and Croix de Guerre). Col. Mallinson was chairman of the North-Eastern Centre of the Institution of Electrical Engineers in 1947-48.

Mr. A. C. Bryant, A.M.I.E.E., Assoc.I.Mech.E., who succeeds Col. Mallinson at Newcastle, received his technical training at Faraday House where he was awarded a first-class diploma in electrical and mechanical engineering. He joined J. & P. in 1936 as a junior engineer in the Contract Department. In 1946 he was transferred to Edinburgh, taking charge of all contract work in Scotland, and in 1952 he was appointed assistant manager of the Edinburgh branch.

The board of Associated Electrical Industries, Ltd., has announced that the following appointments will take effect from 11th October:—**Dr. I. R. Cox,** D.S.O. (managing director of Metropolitan-Vickers Electrical Co., Ltd.), will become group managing director of the A.E.I. Overseas Group; **Dr. C. Dannatt,** O.B.E., M.C. (deputy managing director of Metropolitan-Vickers), will become group managing director of the Metropolitan-Vickers group of companies; **Mr. E. H. Ball** (managing director of the British Thomson-Houston Co., Ltd.) will become group managing director of the British Thomson-Houston group of companies; **Mr. A. N. E. McHaffie** (financial comptroller, A.E.I.) will become group managing director of the Ediswan-Hotpoint group of companies; **Mr. G. A. Cheetham** will become a director of Metropolitan-Vickers; and **Mr. D. Q. Holland** (assistant to comptroller, A.E.I.) will become chief accountant of A.E.I. Dr. Cox and Mr. Ball are already directors of A.E.I., and Dr. Dannatt and Mr. McHaffie joined the board of A.E.I. on 1st October.

Mr. B. W. Burnett has been appointed assistant secretary of Associated Electrical Industries, Ltd.

The Brush Group, Ltd., announces that **Mr. J. W. C. Milligan** has relinquished his position as managing director of the Brush Electrical Engineering Co., Ltd., a subsidiary company of the Group. Mr. Milligan, first as general manager and latterly as managing director, has been in charge of the principal electrical factory of the Brush Group at Loughborough during the last five years. **Mr. M. Tattersfield,** at present deputy to Mr. Milligan, will assume responsibility for the management of Brush Electrical Engineering Co., Ltd., as director and general manager.

Mr. D. H. Smith, B.Sc.(Eng.), A.M.I.E.E., has joined the Brush Electrical Engineering Co., Ltd., Loughborough, as chief engineer of the transformer division. Mr. Smith received his early education and training at the Northampton Polytechnic, London, and with the Lancashire Dynamo & Crypto, Ltd. He has been connected with the manufacture of transformers for twenty-nine years, first as a design and research engineer with Ferranti, Ltd., then with the General Electric Co., Ltd., and later with Bruce Peebles & Co., Ltd., where he held the post of chief transformer designer from 1943 to 1953, after which he was appointed deputy manager of the Transformer Department.

Mr. D. H. Smith

The Metropolitan-Vickers Electrical Co., Ltd., has announced that the chairman, **Sir George Bailey,** and the deputy chairman, **Sir Felix Pole,** have resigned from the board. **Viscount Chandos** (formerly Mr. Oliver Lyttelton) has been elected a director and chairman of the board. Viscount Chandos became chairman of Associated Electrical Industries, Ltd., in August last, after his resignation of the post of Colonial Secretary. Previously he had been with the company from 1945 until he joined the Government in 1951. He also recently became chairman of the British Thomson-Houston Co., Ltd.

Sir Felix Pole, who is seventy-seven, was chairman of Associated Electrical Industries, Ltd., from 1929 to 1945. He began his career as a railway clerk at Swindon at the age of fourteen and was general manager of the old Great Western Railway from 1921 to 1929. He relinquished his post as chairman of the British Thomson-Houston Co., Ltd., last month, and also resigned his seat on the board. Sir George Bailey, deputy chairman, resigned from the board at the same time. Sir George, who is seventy-four, took over chairmanship of Associated Electrical Industries, Ltd., when Viscount Chandos entered the Government. He started work as an apprentice of sixteen in a bicycle firm at Loughborough, and joined the Metropolitan-Vickers Co. as a draughtsman. He was in charge of production at the company's works at Trafford Park, Manchester, for twenty-five years before becoming production head of the whole group. Sir Felix Pole and Sir George Bailey remain on the board of Associated Electrical Industries, Ltd.

Mr. G. R. King has been appointed a director of the Revo Electric Co., Ltd.

Mr. A. W. P. Macwhinnie has resigned from the board of Crabtree Electrical Industries, Ltd., and its subsidiary company.

Mr. D. G. W. Acworth, M.A., M.I.E.E., manager of the Export Department of the General Electric Co., Ltd., and a director of the Anglo-Argentine General Electric Co., Ltd., has been appointed a director of each of the overseas companies of the G.E.C. in Australia, New Zealand, South Africa, Central Africa, India, Pakistan, Burma, Malaya, Hong Kong and Canada.

Mr. D. G. W. Acworth

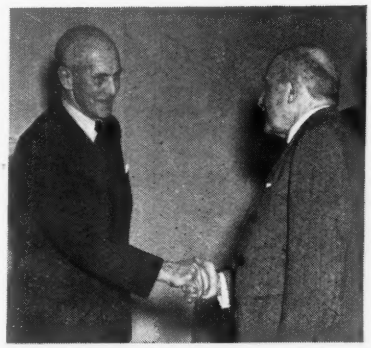
Educated at Radley and St. John's College, Cambridge, Mr. Acworth joined the G.E.C. in 1923. He specialized in heating and cooking and was an original member of the Household Appliances Department under Mr. F. Winstanley in 1926. He later visited Australia, New Zealand and the West Indies. In 1933 he was

appointed manager of the Domestic Cooker Department. He was chairman of the B.E.A.M.A. Cooker Section in 1946 and 1947 and was a founder member of the I.E.E. Utilization Section Committee; he has also served on several B.S.I. committees connected with heating and cooking.

He succeeded Mr. H. W. Adams as manager of the Export Department in 1948 and has travelled extensively overseas during the past six years.

Colonel Cyril Banks, M.P., director of N. G. Bailey & Co., Ltd., electrical contractors, during a visit to Cairo as the guest of the Egyptian Government, has accepted the invitation of the Prime Minister, Colonel Nasser, to be adviser to the Egyptian Council of National Production. This advisory capacity will entail ascertaining which British concerns would be willing to take part in the various production and constructional programmes now under consideration by the Council.

The retirement is announced of **Mr. F. R. Unwin,** M.I.E.E., manager of the Instrument and Switchgear Department of the General Electric



Sir Harry Railing, chairman and joint managing director of the G.E.C wishing Mr. F. R. Unwin a happy retirement

Co., Ltd. Mr. Unwin, who was appointed manager of the Instrument and Switchgear Department in 1945, was for eighteen years previously district manager of the company's branches in Ireland. He joined the G.E.C. in 1919 after an apprenticeship with Crompton & Co., Ltd., at Chelmsford, and a period of technical training in electrical engineering at Central Technical College, South Kensington, followed by two years in the heavy engineering test bays at the Rugby works of the British Thomson-Houston Co., Ltd. During the 1914-18 war he served with the Royal Engineers (T.A.). After a refresher course at the Witton engineering works, Mr. Unwin was attached to the Birmingham sales branch as branch engineer and was in 1923 appointed assistant manager, the position he held until he was appointed manager of the Irish district in 1927. He was chairman of the Irish Centre of the Institution of Electrical Engineers in 1933, and later vice-president of the Belfast Association of Engineers. In addition to his professional duties, Mr. Unwin took an active part in the social life of Northern and Southern Ireland.

Mr. Unwin is succeeded as manager of the Instrument and Switchgear Department by **Mr. J. Lawrence,** who joined the G.E.C. in 1921, and until 1930 was Midland area manager for the Express Lift Co., Ltd. He later transferred to the parent company and worked at the Birmingham branch until 1940, when he was appointed assistant district manager for Scotland. In 1945, Mr. Lawrence was appointed assistant district manager for the north-west area at the G.E.C. Manchester branch where he has remained until his present appointment.

Mr. J. Lawrence

Dowding & Mills, Ltd., Birmingham, announce that owing to the expansion of their London business, it has been found necessary to effect a reorganization. As a consequence, **Mr. P. Hollings,** who was formerly assistant to the general manager at the main Birmingham works, will take over duties as London manager at the works at 24, White Post Lane, Hackney, E.9. **Mr. W. G. Smith,** formerly the London manager, has been appointed technical manager of the London works. **Mr. W. L. Henderson,** A.M.I.E.E., M.A.S.E.E., retains the responsibilities of London sales manager. In addition, **Mr. R. P. F. Todd** has been appointed as an additional engineer representative.

Following the appointment of **Mr. Brian H. Colquhoun,** B.Sc., M.I.C.E., M.I.Struct.E., senior partner of Brian Colquhoun & Partners, consulting engineers, as engineering adviser to the International Bank for Reconstruction and Development (World Bank), for a period of two years on secondment, the firm has taken three of its senior engineers into partnership, namely: Mr. W. J. Llewellyn, M.I.C.E., A.M.I.W.E., Mr. P. Mason, B.Sc., A.M.I.C.E., A.M.I.Struct.E., and Mr. A. U. Shiach, A.M.I.C.E.

Mr. W. M. York, executive director, publicity, with E. K. Cole, Ltd., left London by air last Sunday for a tour of the United States and Canada. While in North America Mr. York will study both commercial and colour television.

Last Monday the finals of the **Electrical Industries Golf Championship** (in aid of the Electrical Industries Benevolent Association) were played off at the Moor Park Course, with the result that Mr. A. O. Ahlquist (North-West Area) secured the Sir Montague Hughman Trophy, the runner-up being Mr. H. J. Holton (Southern Area). The J. Y. Fletcher Cup for the best scratch score went to Mr. L. Chittenden (Southern Area). The Visitors' Rose Bowl was won by Mr. J. L. Taylor and the runner-up was Mr. J. H. S. Ross. Mr. D. H. Melhuish secured the Veterans' Trophy. Messrs. F. B. Dennis and R. Westcott were successful in the foursomes, the runners-up being Messrs. A. E. Taylor and P. McNeill. The trophy for the visitors' best scratch score went to Mr. C. E. Furness.

The prizes were presented at a dinner held in the evening at the Park Lane Hotel, London, W., when Sir Henry Self (chairman) presided. Mr. Leslie Gamage proposed the toast of the Championship and offered to make up to £3,000 the proceeds from the competitions. Mr. E. A. Mills handed over a cheque for £1,230 raised by the London Area Committee.

Sir Henry Self, responding to the toast, thanked all who had contributed to the success of the competitions, mentioning particularly Sir Montague Hughman, who was unable to be present, Messrs. A. E. Mills and L. H. Welch of the London Committee, and Mr. Frank Farthing, assisted by Miss Woodley.

The health of the E.I.B.A. was proposed by Mr. Mills, who expressed appreciation of the work of the secretary, Mr. H. Senior Fothergill, and his staff. Last year, Mr. Mills said, the number of cases assisted rose by 24 per cent but the revenue was only 3 per cent higher. Only about a quarter of the 225,000 possible beneficiaries in the industry contributed to the funds.

Sir John Dalton (president, E.I.B.A.) replied, and in doing so announced that the competition had resulted in the raising of the record sum of £2,650. He thanked Mr. W. B. Taylor, the Championship's treasurer, for his work.

Mr. Frank Coan retired last week after fifty-four years' service with Laurence, Scott & Electromotors, Ltd., at Norwich. During this time Mr. Coan held a number of positions on the commercial side. For many years he was personal secretary to Mr. W. H. Scott, the founder of the company, and on Mr. Scott's death he continued in the same position with the late Capt. G. J. Scott. Since Capt. Scott's death, early in the last war, Mr. Coan has been labour officer and "father" of the apprentices.

Mr. F. Coan

Mr. N. H. M. Steinbock and **Mr. H. M. Whitcombe** have been appointed additional directors of R. B. Pullin &

Co., Ltd. Mr. Steinbock has been associated with the Pullin group for several years, previously as general manager of Measuring Instruments (Pullin), Ltd., and for the last four years as general manager of the

Mr. H. M. Whitcombe

Mr. N. H. Steinbock

parent company. Mr. Whitcombe joined the company on its incorporation in 1932 as test engineer. He later took over the duties of chief of the Test Department, and in 1948 was appointed technical sales manager, in control of the Sales and Contracts Departments.

The West Lancs, Merseyside and North Wales Branch of the **Electrical Industries Benevolent Association** is holding its annual buffet-dance at the Hotel Victoria, New Brighton, on 11th November. Tickets (17s 6d each) may be obtained from Mr. A. Nuttall, Merseyside and North Wales Electricity Board, Love Lane, Liverpool.

OBITUARY

Mr. L. Wall.—The death occurred on 25th September, at the age of fifty-six, of Mr. Leslie Wall, Birmingham sales manager of Electrical Components, Ltd. Mr. Wall had been associated with the company for thirty-five years, and was its oldest employee in years of service. He was well known in the Birmingham area as hon. secretary of the Birmingham Branch Area of the Electrical Industries Benevolent Association. He had been a councillor for the Boldmere West Ward of Sutton Coldfield since 1952.

Mr. P. M. Pinder, M.I.E.E., superintendent of Ironbridge power station, Shropshire, from the time it was built twenty-two years ago until his retirement in 1953, died on 27th September, aged sixty-seven. Mr. Pinder was educated at Harrogate College, the Edward VI Grammar School, Retford, and Leeds School of Technology, and received his technical training with William Dawson & Sons, Otley, and the Larne Electric Light Works. He served as charge engineer successively with the Scottish Central Electric Power Co., the Altrincham Electric Supply Co., Ltd., and Wolverhampton Corporation before becoming superintendent at Ironbridge in 1931, having supervised most of the constructional work beforehand.

United States Exports

Distribution in 1953

SOME of the more important markets in 1953 for certain of the electrical manufactures of the United States are shown in the accompanying tables which give their value in that year with notes of increases or decreases compared with 1952. Decreases in exports of power plant, refrigerators and washing machines were offset by increases in radio and television apparatus and lamps and some other goods. Provisionally the total value is given as $645 million, about $40 million less than in 1952.

The export trade in radio and television goods is given in great detail under no fewer than 17 group headings, of which the more interesting are radio and television receiving type tubes totalling over $13 million in value, with about 80 different destinations. Among these some of the more important include (values in $000) Canada 7,714, Mexico 835, Cuba 381, Colombia 209, Venezuela 225, Chile 222, Brazil 536, France 557, Italy 228, Japan 237. At the same time exports of radio and receiving set components unspecified totalled nearly $17 million in value.

Class of Equipment	1953 $ (000)	Inc.or dec. on 1952 $ (000)
Generators d.c.	3,122	− 322
To Canada	2,610	+ 21
,, Mexico	20	− 11
,, Venezuela	130	+ 110
,, Peru	26	− 38
,, France	39	+ 39
,, Pakistan	105	+ 102
,, Arabia	25	+ 13
Generators a.c.	5,067	− 1,410
To Canada	1,030	− 49
,, Mexico	1,191	+ 943
,, Colombia	213	+ 35
,, Venezuela	103	− 10
,, Brazil	549	− 403
,, Philippines	116	− 259
,, Spain	156	+ 156
Steam turbo-generator sets under 500 kW	775	+ 7
To Canada	276	− 13
,, Mexico	93	+ 61
,, Colombia	140	+ 94
,, Brazil	95	− 20
Ditto 500 to 7,500 kW	6,975	+ 384
To Canada	1,154	+ 978
,, Mexico	512	+ 283
,, Colombia	609	+ 472
,, Brazil	426	+ 238
,, Kuwait	903	+ 903
,, Australia	1,219	+ 42
Ditto, 7,500 kW and over	4,283	− 197
To Venezuela	630	+ 29
,, Philippines	1,060	+ 965
,, Australia	1,400	+ 223
Diesel-electric sets	26,006	− 4,353
To Canada	4,057	+ 903
,, Mexico	4,154	+ 2,077
,, Colombia	1,530	− 547
,, Venezuela	2,244	+ 623
,, Brazil	2,927	− 1,631
,, S. Arabia	1,276	+ 608
,, Siam	1,636	+ 855
,, Indonesia	1,394	− 1,273
Power transformers over 500 kVA	5,738	− 2,771
To Cuba	735	+ 545
,, Venezuela	531	+ 162
,, Peru	516	+ 373
,, Chile	494	+ 298
,, Brazil	1,313	+ 169
,, S. Arabia	408	+ 408
Power transformers under 500 kVA	5.329	− 1,524
To Canada	472	+ 53
,, Mexico	185	− 178
,, Cuba	530	− 1,275
,, Colombia	534	+ 121
,, Venezuela	1,294	+ 278
,, Spain	269	+ 269
,, S. Arabia	277	+ 21
Instrument transformers	1,673	− 162
To Canada	393	+ 8
,, Mexico	141	− 183
,, Colombia	201	+ 109
,, Venezuela	122	+ 17
,, Brazil	135	+ 7
Motors, 1 to 200 h.p.	9,454	− 3,718
To Canada	2,735	+ 47
,, Mexico	692	− 853
,, Colombia	389	+ 43
,, Venezuela	857	+ 5
,, Peru	371	+ 28
,, Chile	490	− 282
,, Brazil	596	− 149
,, France	250	− 348
,, S. Arabia	204	+ 204
,, Philippines	397	− 82
,, India	138	+ 138
To Japan	114	+ 114
Motors over 200 h.p.	4,078	− 2,381
To Canada	261	− 332
,, Mexico	442	− 205
,, Venezuela	425	+ 309
,, Chile	227	− 246
,, Brazil	638	+ 178
,, Netherlands	254	− 8
,, France	185	− 817
,, S. Arabia	325	+ 325
,, Yugoslavia	178	+ 178
Elec. locomotives, mining and industrial	2,059	− 444
To Canada	594	− 336
,, Peru	105	− 52
,, Mexico	151	+ 33
,, Chile	167	+ 58
,, Spain	189	+ 189
,, S. Africa	278	+ 223
Portable electric metal working tools	4,235	+ 187
To Canada	2,709	+ 764
,, Mexico	269	− 18
,, Venezuela	194	+ 49
,, Colombia	121	+ 20
Household elec. refrigerators	59,999	− 811
To Canada	26,330	− 1,144
,, Colombia	3,144	+ 420
,, Venezuela	4,195	+ 755
,, Brazil	1,217	− 122
,, Cuba	4,796	− 1,793
,, Belgium	1,100	+ 448
,, France	1,164	+ 664
,, Italy	1,591	+ 425
,, French Morocco	1,033	+ 491
,, Turkey	1,09 0	+ 229
Lamps, filament, miniature, small, etc.	4,631	+ 617
To Canada	1,991	+ 1,003
,, Colombia	109	− 16
,, Venezuela	136	+ 25
,, Mexico	160	+ 54
,, Philippines	135	+ 1
,, India	117	− 284
,, Siam	116	+ 64
,, Australia	131	− 9
,, Union of South Africa	237	+ 94
Lamps, filament, large	5,155	+ 2,379
To Canada	2,962	+ 2,435
,, Mexico	195	+ 99
,, Colombia	172	− 71
,, Venezuela	325	− 48
,, Italy	120	+ 74
,, Philippines	129	− 42
Fluorescent bulbs and tubes	3,803	+ 857
To Canada	693	+ 575
,, Colombia	107	− 19
,, Belgium	261	+ 19
,, France	311	+ 167
,, W. Germany	185	+ 42
,, Switzerland	326	+ 146
,, Italy	423	− 233
Elec. washing machines, household, semi- and fully automatic	4,132	− 881
To Mexico	127	− 245
,, Colombia	659	+ 651
,, Venezuela	807	+ 737
,, Canada	1,010	− 844
,, Brazil	163	+ 155
,, Italy	178	+ 70
Cooking ranges, household, over 2½ kW	3,013	+ 853
To Canada	1,768	+ 874
,, Colombia	299	+ 12
,, Venezuela	84	+ 10

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Refrigerator Guarantees

I HAVE just seen the letter in your issue of 17th September on the above subject and would invite the writer of it to send full details of his experience to this Association as I should be very pleased to look into the matter on his behalf.

In the meantime, however, I would point out that your correspondent apparently took no steps until some two and a half years after his purchase, although the general period of guarantee on the cabinets of domestic refrigerators is twelve months, and I should have thought this was well known particularly to members of the electrical industry.

The domestic refrigerator industry is made up of numerous firms manufacturing a variety of models; the value of the national output now exceeds £15 million per annum and over 60 per cent of this is exported. In the circumstances I would suggest that one transaction could not possibly justify the general statements made by your correspondent, and that statements to the detriment of such an important export industry ought not to be made unless fully justified. I feel sure that on reflection your correspondent will agree with this view.

London, W.C.2. T. WHITTAKER,
Director,
British Refrigeration Association.

Earthing in Domestic Premises

ALTHOUGH earthing is necessary under I.E.E. regulations, it can definitely introduce danger from electric shock in situations where no other deliberately or otherwise earthed metal exists, i.e., the conditions often pertaining to the normal living room.

A further danger is that a kitchenette containing a cooker, a washing machine, a refrigerator, a kettle, etc., constitutes a "solid earth" surrounding any person working there. It only requires a frayed flexible on an iron, or kettle, to make the danger real, as most electrical fatalities seem to occur where there is the possibility of an earthed electrode. It would appear, therefore, that all flexible leads to irons, kettles, or other portable electrical apparatus when used in kitchenettes or bathrooms should be metal covered, earthed and bonded; and this would be a problem indeed for the manufacturers and others.

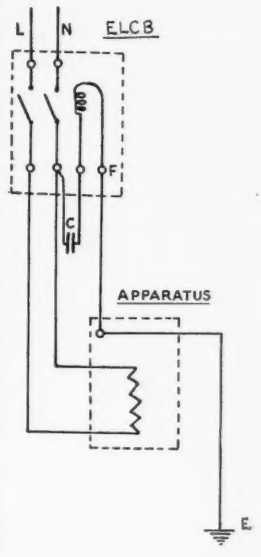
The alternative to this would be to insulate all exposed earthed electrodes in domestic dwellings, which seems impracticable, but which would definitely reduce fatalities.

Woodford Green, Essex. J. GRIFFITHS.

Earth Leakage Protection

WITH regard to recent correspondence on earthing farm installations where the earth resistance of the water pipe system dictates the use of an earth leakage circuit breaker and where it has been found difficult to obtain an isolated earth zone for the e.l.c.b. earth spike, it might interest your correspondents to know of tests which I have carried out in this connection and which would appear to be satisfactory in service.

The arrangement is to connect one side of the e.l.c.b. coil to the metal frames including the water pipe system and the other end through a suitable capacitor to neutral. The value of the capacitor chosen must be such that tripping between frame and neutral does not exceed 40 V and also must ensure that the frame to earth voltage will not exceed 10 V (the border of sensibility) should there be a feed back due to rise of voltage on the neutral. As far as the case under consideration is concerned the earth resistance of the water pipe system will not be as high as 200 ohms and the possibility of serious rise of voltage in the neutral is most remote. The accompanying diagram shows the proposed wiring connections.



The figures given in the table below concern "A," an e.l.c.b. with indirect tripping and "B," an e.l.c.b. with direct or series tripping. The e.l.c.b. normal tripping currents are "A," 27 mA; and "B," 67 mA.

E.L.C.B. "A"			
Normal Connections		Tests with proposed connections (2 Mfd capacitor) Volts to trip, frame to neutral 27 V	
Earth resis. — ohms	Tripping volts	Max. rise of voltage on neutral without tripping	Associated voltage frame to earth
0	4·5	26	0
200	9·0	30	4
500	16·0	34	13
E.L.C.B. "B"		Volts to trip, frame to neutral 36 V (4 Mfd capacitor)	
0	9·4	36	0
200	18·0	42	13
500	36·0	51	29

These tests indicate that the proposed method will be safe in use. I shall be interested to know your readers' views on this suggestion.

Dumfries. C. R. JACK.

Brighton Trolley-Bus Decision

At a special meeting last week the Brighton Council decided not to accept the Transport Committee's recommendation to scrap the town's trolley-bus fleet. This means that Brighton's trolley-buses will have a new lease of life. Instead, a special sub-committee was set up to try and negotiate a new agreement with other local operators for an integrated transport system covering the whole area.

Automatic Circuit Reclosers

Demonstrations by the Midlands Electricity Board

To demonstrate the use of automatic circuit reclosers under conditions which conform as closely as possible with those which obtain in service, a three-phase 11 kV wood pole line has been constructed at the Upton Warren substation of the Midlands Electricity Board and last week we had the pleasure of witnessing an interesting demonstration.

Reclosers of varying types and makes were installed on the intermediate poles as in service, and ground operated shorting equipment provided so that these reclosers could be readily taken out of the test circuit. The test circuit was supplied from the adjacent 11 kV substation, but to avoid heavy shocks to the public supply system the test circuit was fed through an 11/3·3 kV transformer and all demonstrations undertaken at the reduced voltage. The automatic circuit reclosers are, however, generally suitable for operating at voltages down to 2 kV and this reduced test voltage has no deleterious effect.

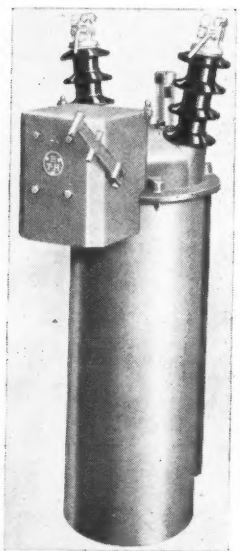
To simulate fault conditions at points near to, or remote from, the supply substation, series reactors and shorting switches were provided. To clarify the conditions which obtain when reclosers are subjected to test during the demonstration, a mimic diagram was available showing a single line circuit of the test conditions, together with lamp indication of changing conditions during test. Reclosers made by two American manufacturers and one British were installed on the demonstration circuit and could be selected at will for demonstration; the table shows the characteristics of the reclosers concerned.

The demonstration consisted of three main parts. First, there was a series of tests which demonstrated the satisfactory operation of the American automatic circuit reclosers when operating within the co-ordination range of the substation protection, line fuses and the recloser characteristics. The opportunity was also taken to demonstrate an American recloser having a very short open circuit time, although such a feature would not be suitable on British systems, as the circuit time would be insufficient to allow clearance of transient faults which have resulted from the presence of foreign bodies, such as twigs, straw, etc. Second, a series of tests of American type reclosers indicated unsatisfactory operation where system conditions fall outside the correct co-ordination range. The third series of tests demonstrated the satisfactory operation of a British recloser.

It is obvious that the introduction of high speed reclosers will, by dealing rapidly with transient faults, reduce appreciably the number of interruptions to supply noticed by consumers. Although the high speed reclosers already installed on the 11 kV system of the Worcester and District Sub-Area of the M.E.B. are too few to affect the picture at present, various improvements have led to a reduction in the faults per mile of mains.

While progress has been made reducing the likelihood of unpremeditated interruptions, the number of pre-arranged interruptions has considerably increased, and last year amounted to a total of 518 in this Sub-Area. This is due to the large scale extensions taking place to the 11 kV overhead system, and more particularly to the fact that as the more isolated consumers are connected, and reinforcements are carried out to meet the increased load, the number of new substations is rapidly increasing; in fact in this Sub-Area alone 443 new substations were commissioned last year. Occasions frequently arise when it is necessary to interrupt the supply to several hundred consumers for a period of up to three hours for the purpose of commissioning a 5 kVA transformer for one consumer.

Although " hot line " working on all voltages is practised throughout the United States as a matter of routine, and the technique is familiar to most engineers in this country, so far as we are aware no steps have yet been taken by Area Boards to adopt this technique. Special tools and techniques were demonstrated privately last week which are simple and modest, but safer even than the existing practice of Tebo Stick testing. Until further experience has been gained it is intended that all " hot line " work should be carried out from ground level and that it should be confined to the tapping on of spur lines, and the erection and commissioning of pole mounted transformers of up to 25 kVA capacity. Even with this limited field of application it is anticipated that there will be great savings and improvement in maintenance of the supply.



B.T.H. pole mounting automatic circuit recloser

AUTOMATIC CIRCUIT RECLOSER CHARACTERISTICS

	MANUFACTURER				
	American General Electric Co.		Railway & Industrial Engineering Co.		British Thomson-Houston Co., Ltd.
Normal Current Rating	25 A	50 A	60 A	100 A	15/30 A
Working Voltage	15 kV	15 kV	15 kV	15 kV	11 kV
Minimum Tripping Current	50 A	100 A	120 A	200 A	30/60 A
Maximum Breaking Current	625 A	1,500 A	1,500 A	2,000 A	790/1,580 A
Equivalent three-phase symmetrical breaking capacity at 11 kV	11·9 MVA	28·6 MVA	28·6 MVA	38·1 MVA	15/30 MVA
Tripping Sequence	2 instantaneous trips plus 2 time delay trips		1 instantaneous trip plus 2 time delay trips		2 instantaneous trips plus 2 time delay trips
Open Circuit Time	1·0 sec		0·5 sec and 5 sec		1·0 sec
Operating Time at Minimum Tripping Current—					
(a) High Speed	0·13 sec		0·045 sec		0·2 sec
(b) Inverse Time Delay Trip	5 sec		7·6 sec		6·0 sec
Operating Time at Maximum Breaking Current—					
(a) High Speed	0·045 sec		0·025 sec		0·03 sec
(b) Inverse Time Delay Trip	0·12 sec		0·25 sec		0·2 sec

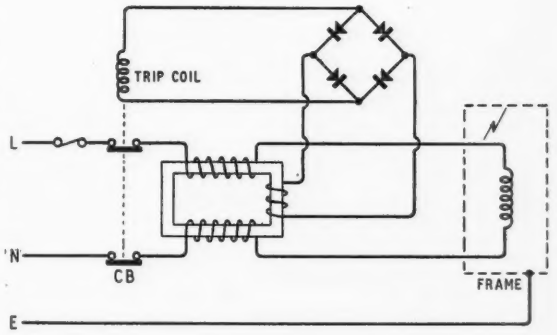
Electrical Accidents

MAIN particulars relating to the 721 accidents (including 38 fatal) in industry during 1952 were given in the annual report of the Chief Inspector of Factories, relevant extracts from which were given in the *Electrical Review* of 2nd July. This information has now been published in amplified form for the Factory Department, Ministry of Labour and National Service, by H.M. Stationery Office under the title of " Electrical Accidents and their Causes, 1952 " (69 pages, with 4 plates and 8 diagrams, at 3s). The publication is divided into 22 sections in which various risks are discussed with constructive criticisms and suggestions for improvement.

The principal safety aspects covered include: electricity supply systems; earth leakage protection; stopping machinery (dynamic braking); instruments and control in hazardous situations; fires and explosions; designing for safety; aircraft testing; maintenance of electronic-equipment; flameproof enclosure.

Special mention is made of a recently developed device for providing differential current earth leakage protection for small and medium-sized installations, as shown in diagrammatic form. In this each circuit breaker controlling an outgoing circuit has thermal overload and electro-magnetic protection and in addition differential current earth leakage protection, which ensures that only a faulty circuit is opened. Leakage current does not return by the neutral coil, and the resulting unbalance between the two primary windings of the transformer causes a current to flow in the secondary winding which trips the circuit breaker. The apparatus frame is earthed solidly. Sensitivity is approximately 0·5A and even if the total resistance of the fault current path reached 480 ohms at 240 V protection is said to be assured.

Correct and incorrect methods of installing earth leakage



Earth leakage protection for small and medium-sized installations

indication and recording instruments (for revealing incipient faults) are shown by five diagrams relating to actual instances. Tests of earth electrodes in factories of a number of types indicating their effectiveness on circuits fused up to 15 A and on circuits protected by the largest fuses on the premises are tabulated. To supplement recommendations regarding out-door and temporary installations, a composite diagram shows various methods of protecting portable and transportable electrical apparatus. Features of 65 failures of apparatus with explosive violence or causing fire and often injury or death are given. Certificates issued by the Chief Inspector of Factories in respect of electrical apparatus for use in specified atmospheres are set out in an appendix.

New French Electric Locomotive

IN June last the French Railways' 4,000 h.p. prototype electric locomotive BB 9004, which weighs only 80 metric tons, hauled a test train of 23 passenger vehicles weighing nearly 1,000 metric tons between Paris and Dijon, a distance of 196 miles, in each direction with approximately the same timings as the famous " Mistral " express, which represents an average speed from start to stop of over 77 m.p.h. with a maximum speed of 87 m.p.h. This locomotive is of French design and construction throughout, and was built by the Société de Matériel de Traction Electrique (Schneider-Jeumont-S.W.). The specification submitted to the designers and builders of the four prototypes, BB 9001-9004, called for a BB electric locomotive which should be capable of hauling heavy express trains at the maximum service speed of 87 m.p.h. and of attaining an average speed of approximately 100 m.p.h. on trials, but to have a total weight of only 80 metric tons. This kind of performance had already been secured with the 2-D-2 9100 and CC 7100 classes of French Railway electric locomotives, but their total weights are 140 and 107 metric tons respectively.

This new type of BB electric locomotive has achieved all that was hoped of it during its various trials, the aim of which was to determine the degree of heat generated under such arduous conditions in the SW 4326 traction motors. The specification for these required that the maximum temperature of the armatures should not exceed 120 deg C above that of the atmosphere. For this purpose they are provided with a very powerful system of forced ventilation. The highest temperature of an armature registered during the trial was 116 deg C at the top of the notorious Blaisy-Bas bank, the most difficult section of the run. The maximum power recorded at the drawbar was 4,600 h.p.

The 80 ton locomotive test train of 23 carriages about to leave the Gare de Lyon, Paris, for the Paris-Dijon trial run

INDUSTRIAL NEWS

United States Dam Contract

A *Reuter* message from Washington states that the English Electric Co., Ltd., has submitted the lowest bid for two 68,000 h.p. turbines to be installed at the Army Engineers' Table Rock dam project in Little Rock (Arkansas). The bids were: English Electric, $1,066,662; the Newport News Shipbuilding and Dry Dock, $1,210,125; Allis-Chalmers, $1,238,540; S. Morgan Smith Co., $1,316,205; and the Baldwin-Lima-Hamilton Corporation, $1,350,000.

Acceptance of the low British tender, according to Defence Department officials, will depend on a revaluation of the specifications involved, which might lead to a revision by the Army engineers in the amount offered by the English Electric as a basis for a contract; and whether or not the "Buy America" Act will be applied. Officials stated that the Secretary of the Army would make a final decision after the bid specifications have been analysed.

New Metal Industries Factory

Plans are well advanced for the construction of a new factory at Bromborough (Cheshire) for a number of special products dealt with by the Electrical Division of the Metal Industries Group. A new company is being formed to operate this factory; the directors will be Messrs. K. N. Swash (Brookhirst Switchgear, Ltd.), chairman and managing director, F. R. Livock (Cantie Switches, Ltd.), and T. D. Turner (Igranic Electric Co., Ltd.).

A.S.E.E. Exhibition Company's Donation

On behalf of the Electrical Engineers' (A.S.E.E.) Exhibition, Ltd., Mr. J. Flood recently handed a cheque to Sir Frederick Handley Page, vice-president of the City and Guilds of London Institute. This donation was made in response to an appeal for funds for the Institute made by Sir Frederick and is in line with one of the objects of the A.S.E.E.'s exhibition company—to assist in the advancement of technical education.

A Machine Tool Exhibition

An exhibition to be held at the London Showrooms of the B.S.A. Tools Group (93, Albert Embankment, London, S.E.11) from 18th to 30th October, will feature two interesting factored lines handled in Great Britain by Burton, Griffiths & Co., Ltd. The first is the comprehensive range of machines manufactured by F. Deckel of Munich, whose products include a variety of engraving machines, die sinking machines, pantograph, profile, and tool milling machines and universal tool grinding machines. Then there will be the "Sparcatron" technique of machining hard metals by spark cutting, in connection with which the new heavy duty "Sparcatron" equipment with twin spark machining heads will be displayed.

Public Speaking Competition

There are three subjects from which competitors can make their choice in the Electrical Development Association's 1955 Public Speaking Competition—"Advertising," "Lighting and Living" and "The Social Influence of Electricity." The closing date for entries is 1st December next. The competition will, as usual, be held in two sections—one for women and the other for men. All those in the electricity supply industry (including generating divisions) who have not attained their thirty-fifth birthday on 31st March, 1955, are eligible to enter the competition, which will take the usual form of area contests, followed by the national finals. The first prize-winner in each area takes part in the national finals, which are held in London, where the premier awards are the Faraday silver challenge shields. These shields are held by the Area Board from which the winners come, for one year, the winners themselves receiving replicas of the shield, which they retain. A 20-page booklet, "E.D.A. Public Speaking Competition, 1955," giving full details of the rules of the competition together with some useful hints to speakers, is obtainable, free of charge, from Area Electricity Boards or from the E.D.A., 2, Savoy Hill, London, W.C.2.

Teaching Electrical Housecraft

Electrical housecraft is becoming such a feature of the modern home that teachers in many parts of the country welcome the intensive instruction given in One-Day Conferences arranged by the Electrical Association for Women. Following on the success of similar conferences attended by teachers in the South-West, North-West, North-East, and in Yorkshire, the Electrical Association for Women has arranged another to be held at the Domestic Science Training College, Knighton Fields, Leicester, on 20th November. The day will be occupied by instruction in the use and care of electric cookers, cooking equipment and refrigerators; the use and care of electrical laundry equipment; and the teaching of electrical housecraft in schools.

Zinc Alloy Die Casting Exhibition

The Zinc Alloy Die Casters Association is holding an exhibition of zinc alloy pressure die castings at the Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham, from 25th to 30th October. It will be open each day from 9 a.m. to 5 p.m. It will consist of over 200 different zinc alloy die castings including one of the smallest produced, weighing 0·01 oz. The exhibition coincides with the International Pressure Die Casting Conference being held at Church House, London, from 25th to 28th October.

Indian Lamp Tariff Modifications

Under the Indian Tariff (Second Amendment) Bill the standard customs tariff is increased from 63 to 100 per cent *ad valorem*. Concurrently there is some relaxation in import control on fluorescent tubes when imported from soft currency areas.

"Shadow" Exhibition in London

A miniature of the Scottish Industries Exhibition will shortly be held in London by the Scottish Council (Development and Industry), which is planning a display of catalogues and other literature from every stand in the exhibition.

Carlisle Station Lighting

Work has started on the partial renewal and recovering of the roof and a new electric lighting installation at Carlisle Citadel station which will cost £200,000. It is expected that the scheme will take at least two and a half years to complete.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £295 0s 0d
Fire Refined 99·70%	ton £294 0s 0d
Fire Refined 99·50%	ton £293 0s 0d
COPPER Tubes ..	lb 2s 9½d
Sheet	ton £353 15s 0d
H.C. wire and strip ..	ton £327 10s 0d
LEAD, English ..	ton £106 5s 0d
Foreign	ton £105 0s 0d
MERCURY	flask £105 0s 0d
TIN, block (English) ..	ton £729 10s 0d
ZINC, G.O.B. Foreign	ton £82 5s 0d
Electrolytic	ton £85 5s 0d
BRASS Tubes (solid drawn)	lb 2s 3d
Sheet	ton £281 0s 0d
Wire	lb 2s 10d
PHOSPHOR BRONZE Wire	lb 4s 3½d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 22d–22½d

South Western Board's Finances

In our leading article last week we referred to the deficits incurred in 1953–54 by two Electricity Boards and said that the South Western Board was "saved" by a subvention of £250,000 from the central reserve fund. This was incorrect; actually the Board had a surplus of £98,256 on the year's working. The grant of £250,000 was made by the British Electricity Authority after a review of the Board's finances for the five years ended 31st March, 1953. It "reached the conclusion that the unfavourable position of the South Western Board was likely to constitute a hindrance to the Board's forward planning, particularly of rural electrification."

The Board's accumulated deficit over the five-year period was £318,301; this was reduced by the 1953–54 surplus to £220,045. The £250,000 from the central reserve fund enabled the Board to carry a surplus of £29,955 to the balance sheet.

Carnival Tableau

The Urban District Council of Feltham, Middlesex, has just celebrated its fiftieth anniversary, and the celebrations included a carnival procession and exhibition showing the wide range of industries in Feltham. One of the decorated lorries in the carnival procession was entered by Gresham Transformers, Ltd. This took the form of a ship "manned" by four ladies in naval costume. On the "deck" was one of the company's transformers with a card indicating that Gresham transformers were shipped all over the world.

Christmas Presents

Although the festive season may seem fairly distant, electrical dealers will be interested in electrical apparatus which will have a particular appeal at Christmas time. The General Electric Co., Ltd., has issued particulars of some out-of-the-ordinary Christmas presents.

The bed-and-clothes airer illustrated is a special tubular heater, 4ft in length with a loading of 75 W. Round the heater is built a framework of wooden slats that allows correct air circulation and makes it impossible for clothes to scorch. In a bed it rapidly reaches a temperature of 120 deg F and will air the bed in thirty minutes. It can be left for any length of time with safety. It can also be put in a linen cupboard to air clothes. Other suggested G.E.C gifts include the new portable "Cosyglo" reflector type fire of pedestal design, spare bulb kits for motor cars, a right-angle torch, a lightweight mains portable radio in a wide range of colours, architectural lamps for bed and mirror lighting, and "Gossamerlite" lighting fittings which blend with any style of decoration.

G.E.C. combined bed-and-clothes airer

Section of an exhibition of radio, television and electrical domestic appliances which was held recently at the Leicester branch of Kerry's (Great Britain), Ltd.

Lighting Directory

A directory listing the names, addresses, trade names and products of 250 firms who manufacture lighting equipment has just been published by *Light and Lighting*. The products listed include all types of electric lamps, luminaires, accessories and equipment. Copies of the directory may be obtained from *Light and Lighting*, 32, Victoria Street, London, S.W.1, price 1s 6d post free.

New Pumping Station

One of the most up-to-date pumping installations, the Fulbourn pumping station at Cambridge, was re-opened on 24th September by Mr. Henry Willink, Vice Chancellor of Cambridge University and chairman of the local waterworks company. Fulbourn was originally constructed in 1888 and installed with Beam engine type pumps, with a pumping capacity of a million gallons a day. These were kept in operation until 1920 when the pumping station was closed down as being inefficient. New electrically driven plant has now been installed which will double the output of the original station and enable the rate of pumping to be varied from one to two million gallons a day. All the plant, including the electrical equipment, has been duplicated, even to the extent of installing a two-way feed from the grid, so that the chances of a breakdown affecting water supply are almost negligible. A new feature of the plant is a "jet tank" in which water delivered from the well is sprayed through fine jets to remove any dissolved carbon dioxide in the water, making it less corrosive to metals.

Cleaning Flower Pots

Flower pots can be cleaned at the rate of more than 1,000 an hour by a new electrically-driven machine developed by the Midlands Electricity Board in co-operation with Stoke-on-Trent Corporation Parks Department which has over half a million flower pots in constant use in each of the Department's three sectors. Mr. W. Scriven, agricultural engineer of the M.E.B. produced the prototype machine now in successful operation at the Department's premises at Tunstall. It consists of two one-sixth h.p. motors, driving two revolving brushes, one of which, running at about 600 r.p.m., cleans the outside of the pot, while the other, running at about 500 r.p.m., simultaneously cleans the inside. The centre between the two spindles is variable, so that the size of the brushes can be varied to deal with pots ranging in diameter from 2in to 10in. The machine can be made at a cost of about £50.

Batti-Wallahs' Society

The monthly luncheons of the Batti-Wallahs' Society were resumed on Wednesday last, after the August break, when the speaker was Captain E. M. C. Barraclough, C.B.E., R.N., who gave an address on yachting and yacht racing. Captain Barraclough, whose naval career was spent in the submarine service, like so many retired naval men, is still interested in marine activities, and as a member of the Council of the Royal Yachting Association, and chairman of the Technical

Committee of the International Yacht Racing Union, he gave some interesting details of the activities of these bodies and the work they do to assist and encourage yachting and yacht racing.

The next monthly luncheon of the Society will be on 27th October, when the speaker will be Sir Bruce White.

E.A.W. 30th Birthday

The 30th anniversary of the Electrical Association for Women will occur on 12th November. The Association was inaugurated in the home of the late Sir Charles and Lady Parsons in 1924, under the leadership of its founder-director, Dame Caroline Haslett, and representatives from the electrical and educational fields attended. The E.A.W. National Executive Committee has decided that, in view of Dame Caroline's illness, the official birthday celebrations should form part of the 30th Annual Conference in April, 1955. Dame Caroline is at present recovering in the country at the home of her sister, Mrs. R. Messenger, and hopes to resume activities before the end of the year.

Aluminium Publications and Films

The Aluminium Development Association, 33, Grosvenor Street, London, W.1, has issued a booklet giving details of its main series of technical publications, namely information bulletins, applications brochures, research reports, reprinted papers and articles, and the "Aluminium Courier"; it also includes certain books dealing with the Association's membership, policy, organization and services. A separate list of films, film strips and wall charts is also published.

Cable Literature

Within the last few months the Cable Makers' Association has published a number of booklets dealing with electric cables. The range of subjects has not yet been completed and the booklets will be added to from time to time as suitable subjects present themselves. So far the distribution of these booklets has been somewhat limited, but any of our readers may obtain a copy of any one of the booklets free upon application to the Cable Makers' Association, High Holborn House, 52/54, High Holborn, London, W.C.1.

The three booklets so far available are: "Plastic Cables and Flexible Cords," which contains in the main the principal characteristics, electrical properties and temperature of operation of p.v.c., and the applications, dimensions and methods of installing and terminating p.v.c. cables; "Paper Insulated Power Cables," in which there is information on the manufacturing methods of such cables, the control of their quality and references to special types of these cables and their installation; and "Current Ratings for Aluminium Cables," which in the main constitutes in table form current rating factors for cables having aluminium conductors and/or aluminium sheaths. These factor tables were published in the *Electrical Review* of 19th February last. A fourth booklet, "Modern Rubber Cable Technology," is to be published in the near future.

Packing Research Centre

On 14th October an establishment to study the scientific packing of such products as aero engines and electrical instruments will be opened at Sittingbourne. The laboratory has been built by Export Packing Services, Ltd., at a cost of more than £75,000 and when it is finished the total cost will be over £100,000. The official opening will be performed by Sir Edward Boyle, M.P., Parliamentary Secretary to the Ministry of Supply.

Flood Restoration Record

In the disastrous East Coast floods which occurred early in 1953 many employees of the Eastern Electricity Board showed great bravery and a capacity for sustained hard work. The floods caused considerable damage to underground l.v. networks and consumers' services and installations—far more than could be coped with by the local staffs. A call for volunteers to assist in making good the ravages of the floods resulted in responses from 534 men in other parts of the Board's area and from 50 London Electricity Board employees.

A record of the way in which supplies were restored and installations made good is contained in a handsome illustrated brochure produced by the Eastern Electricity Board as a memento of the period and distributed to those who helped. It is a graphic account of excellent work for which all those who participated are to be highly commended.

Examples of lamp publicity material for the 1954–55 season which Cryselco, Ltd., has available for dealers in its lamps

Thos. W. Ward Acquisition

Thos. W. Ward, Ltd., have purchased the entire share capital of Fredk. Town & Sons, Ltd., of Halifax, machine tool manufacturers. Mr. Harold Vernon and Mr. G. Stuart Wood (directors of Thos. W. Ward, Ltd.) have been appointed to the board and Mr. Harold Vernon has been appointed chairman and managing director. Mr. Eric Town, who has been with the company for twenty-five years, remains as a director and general manager of the company.

Calendar

Richard Klinger, Ltd., of Sidcup, Kent, have sent us a 1954–55 calendar (October to September). The monthly sheets have attractive pictures in colour of beauty spots in various parts of the country. The back sheet has calendars for the years 1954 to 1956.

Trade Announcements

John Harris Tools, Ltd., has opened a sales and stock office at 74, York Street, Glasgow, C.2 (telephone: Central 3187).

The Home Market Sales Department, the London Export Office and the Service Department of the **Nash-Kelvinator, Ltd.,** are now at Hudson Motors Building, Great West Road, London, W.4 (telephone: Chiswick 3621).

Two new representatives have recently joined the sales staff of **H.M.V. Household Appliances** (the Gramophone Co., Ltd.). Mr. C. F. Greenwood will be responsible for the whole of Scotland, Northumberland, Durham and Cumberland, and Mr. R. V. Rushton will be covering the Midlands, East Anglia, and South Wales.

Thorn Electrical Industries, Ltd., has appointed Mr. J. A. Duke as a representative in the Scottish Area of the Atlas Lighting Division. Mr. Duke previously held appointments with Remington Rand, Ltd., and Thomas Ward & Co., Ltd.

Catalogues and Lists

Hotpoint Electric Appliance Co., Ltd., Fletton, Peterborough.—Descriptive list illustrating a new range of electric fires (H.301–1).

W. Canning & Co., Ltd., Great Hampton Street, Birmingham, 18.—Illustrated leaflet on the new "Korant" high conductivity aluminium cored anodes for chrome plating.

Philament Electric, Ltd., Trading Estate, Bridgend, Glam.—32-page illustrated priced catalogue of decorative and commercial lighting fittings.

Electro-Alloys, Ltd., 47, Brunel Road, London, W.3.—Illustrated loose-leaf catalogue in three languages on the company's range of tungsten and molybdenum products.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Technical catalogue dealing with G.E.C. heavy alloy for the aircraft industry.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—Illustrated priced leaflet on "Swan" brand electric heating pads and blankets (650).

Osler & Faraday, Ltd., 89/91, Newman Street, London, W.1.—Broadsheet illustrating the company's new range of contemporary lighting fittings, together with price list.

Appliance Renovation

NEW DISTRICT WORKSHOPS AT BRIGHTON

FOR some years the domestic apparatus repair workshop of the Brighton and Hove District, South Eastern Electricity Board, has been the semi-basement of a building adjoining a convertor substation in Spring Gardens, Brighton. This although of considerable height did not provide ideal working conditions for the staff. It now serves merely as a store, for new workshops have been arranged on the upper floors of the building. They were opened on 30th September by Mr. Norman Elliott, chairman of "Seeboard," who said that the unsatisfactory nature of the old accommodation had long been recognized. There were, however, more urgent improvements in the area which had first to be attended to but he was glad that improved premises had now been made available. Good working conditions were conducive to good work.

Mr. A. M. Harker, the District manager, who welcomed the guests at the opening ceremony, recalled that the Brighton Corporation began the hiring out of domestic appliances, fires at first, as long ago as 1912 when Mr. John Christie was the borough electrical engineer. Mr. Harker said that the new premises would enable a bigger volume of work to be undertaken to a better standard and at lower cost.

Mr. H. Pryce-Jones, manager of the Mid-Sussex Sub-Area, signed two advice notes covering the despatch of the first reconditioned cookers from the new workshops and Mr. C. F. Wells, chief commercial officer of "Seeboard," cut a symbolic cake made by the canteen staff. They and Mr. Elliott were presented with souvenir cigarette boxes, in the form of miniature cookers, produced in the workshops.

The shops are on three floors, with a materials stores on the lower ground floor. Upon the second floor the work consists of the repair and reconditioning of the smaller appliances. There are ten benches upon which new parts are fitted and the re-winding of elements is done. In an adjoining room there are plating vats for the deposition of tin, copper and nickel as well as de-furring vats and polishing machines. During our tour of the shops we saw many examples of time-worn appliances being restored to a practically new condition.

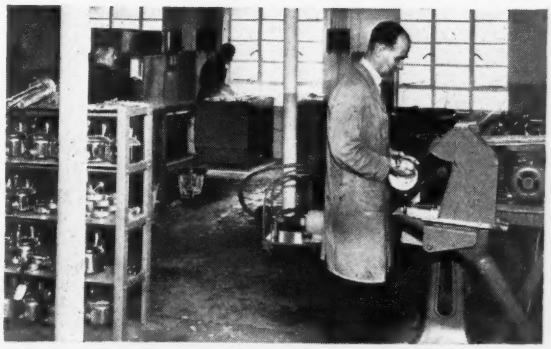
This floor, in common with the others, is well lighted and decorated in pleasing light colours. Rising mains in 4in square trunking are tapped at each floor and d.c. and a.c. supplies are taken by 3in square trunking to the benches and test points. Gas and compressed air are also available.

We were told by Mr. C. S. B. Slight, the district commercial engineer, who, with Mr. J. L. Kirkman, showed us round, that between 10,000 and 11,000 kettles are on hire in the district and the shops deal with 50 or 60 a week.

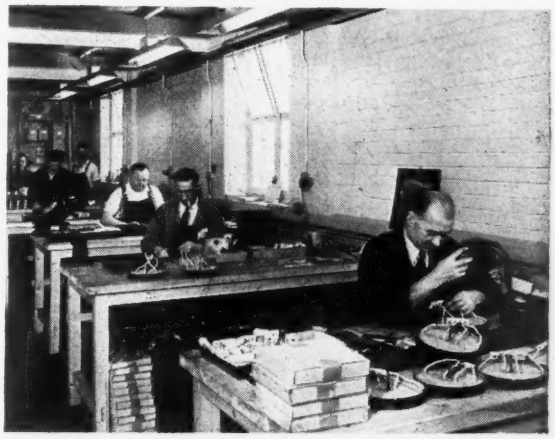
On the first floor is a receiving bay for wash boilers, water heaters and refrigerators which are dealt with in adjoining shops. The equipment includes two spraying booths and two stoving ovens and here again the appliances are thoroughly renovated. A test bench for checking the operation of thermostats on appliances accommodates six at a time and is equipped with audible and visible signals.

Cooker reconditioning is carried out on the ground floor and the practice is to deal with batches of cookers of the same type at the one time to facilitate handling. The equipment here includes caustic solvent baths for cleaning oven interiors, etc., grinding and buffing machines and a test board. It is the practice to replace all oven switches by thermostatic controls. Vitreous enamelling is done by outside contract and this, by the way, applies also to motor re-winds.

The three floors have a total area of 7,500 sq ft and there is a staff of about forty.



Small appliance renovation; plating vats in background



Above: Boiling plates being rewound and re-insulated and (below) activity in the cooker reconditioning shop

Electrical Research

THE nature of the processes in the cathode dark space and the negative glow of a glow discharge is not well understood. Moreover, the existing theory leading to relations between the cathode fall in potential, the current density, the width of the dark space and the electric field distribution in it is based on dubious assumptions, and does not indicate the important physical processes in operation. Thus further experimental evidence would be valuable in developing the theory.

By exploring the electric field between two plane parallel cathodes with an electron beam, and observing simultaneously the other discharge parameters new information was obtained. A double (hollow) cathode was used because in a conventional glow discharge the dark space, cathode fall and current density are interdependent: here the cathode separation controls the width of the dark space. When the separation is sufficiently reduced the two negative glows coalesce and the light emitted as well as the cathode current density rise greatly. This is the hollow cathode effect.

An elementary theory is developed in E.R.A. Report Ref. L/T306, "The Hollow Cathode Effect and the Theory of Glow Discharges," by P. F. Little and A. von Engel (price 15s), which covers both the hollow and the conventional glow discharge in various gases, as indeed it should, since with increasing cathode separation the first goes over into the second type. The main feature is the contribution of the ultraviolet quanta from the glow to the photoelectric emission from the cathodes which is regarded as the essential factor in secondary electron emission.

Hydrogen from Wind Power

When wind power units are operated—either singly or in groups—independent of a supply network, it may be necessary to store the wind-generated electrical energy. Of the many possible alternatives, hydrogen storage possesses certain advantages. Report Ref. C/T111, "The Economic Value of Hydrogen Produced by Wind Power," by A. H. Stodhart (price 9s), studies the economic value of hydrogen produced by wind power and compares its cost with that of providing energy by other means.

As a means of supplying heating and lighting to an isolated community the report shows that a windmill-hydrogen plant is, even under the most favourable conditions, twice as costly as paraffin. This difference in cost is rather less marked when a windmill hydrogen generator plant is compared with a diesel generator but is still over 50 per cent more costly.

In conditions where the economic considerations are of secondary importance—e.g. at isolated observatories and meteorological station, at base camps for Polar expeditions, etc.—the versatility of the hydrogen fuel may be an advantage, but the large bulk of the equipment required, together with possible difficulties caused by icing on the windmill blades under very severe weather conditions, may outweigh any such advantage.

Wind Power in Denmark

Progress in the development of wind-driven electric generators in Denmark has continued from 1891 to the present day. Machines of this kind have been used more successfully and more extensively than in any other country but the information published on the subject outside Denmark itself has been less than the progress deserves. Report Ref. C/T112, "The Use of Wind Power in Denmark," by E. W. Golding and A. H. Stodhart (price 15s), seeks to rectify this by describing the developments during the period mentioned and by outlining the background against which they have taken place. The object has been to enable the Danish work to be considered in the light of that which is now being done in Great Britain and other countries aiming at the use of wind power for electricity generation on a significant scale.

Copies of the above reports are available at the prices indicated in parentheses on application to the British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

Future Power Resources

IN his inaugural address as president of the Manchester Association of Engineers on 1st October, Mr. J. N. Clift deprecated undue concentration upon nuclear fission at the expense of other possible sources of power more immediately available. The crux of the matter, he said, was not reserves of coal, which were estimated to last for at least 250 years, but the improbability of increasing its production to meet demands soon enough or in sufficient quantity. He questioned whether nuclear fuels alone could ever generate steam at higher temperatures than those in use thirty years ago. Moreover coal was needed for other purposes than power, for which nuclear energy could never be a substitute.

The basic essential to civilization was electricity and in twenty years' time the B.E.A. would require 26 million more tons of coal a year which could be provided by more efficient use in all industries, such as by the replacement of obsolete boilers. The newly formed National Industrial Fuel Efficiency Organization was without authority to make its recommendations effective and diversion of capital to reducing fuel bills instead of improving production costs was commercially unattractive. Mr. Clift suggested that the capital costs of fuel-saving equipment should be offset against profits tax instead of against profits before tax. He advocated the adoption of district heating and the raising of thermal efficiency, by various means described, of the steam locomotive.

Hydro-electric power stations in service or under construction in the Scottish Highlands would save annually over two million tons of coal and resources still to be developed would be equivalent to another four million tons. The need for energy might eventually outstrip the resources of uranium and other fissionable matter and posterity might come to adopt the Mediterranean hydro-electric barrage scheme propounded in 1928. It was claimed that the outer seas could provide enough energy for the whole of Europe and Africa and uncover for cultivation much land now below the surface of the Mediterranean.

Non-Ferrous Metals Course

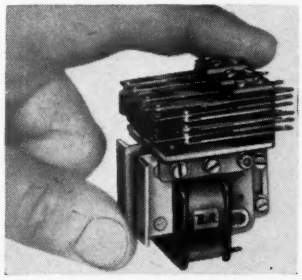
THE British Non-Ferrous Metals Federation has recently initiated the preparation of a new operatives' course in non-ferrous metals of the City & Guilds of London Institute. The new course covers the history and background of the non-ferrous metals industry and deals in detail with all aspects of the plant and processes used in the manufacture and treatment of non-ferrous metals.

A number of technical colleges have included the course in their syllabuses, and in order to publicize the course and attract young people to the industry, the Federation has prepared an illustrated booklet entitled "Just the Job—A Career in the Non-Ferrous Metal Industry." This describes briefly the development of non-ferrous metals, their present importance in the life of the country and the development of new alloys and uses which may be expected to take place in the future. It also stresses the advantages which the new course offers to those wishing to make a successful career in the industry.

NEW ELECTRICAL EQUIPMENT

Miniature Relay

The development of industrial control systems, etc., has brought about the need for a multi-purpose relay which is small in size and yet is extremely robust and reliable, coupled with a long life and ample safety margins. Recognizing this, BESSON & ROBINSON, LTD., 6, Government Buildings, Kidbrooke Park Road, London, S.E.3, have designed a miniature relay



Besson & Robinson miniature relay

which satisfies all these requirements and have undertaken an extensive programme of tooling in their works to produce it in quantity. In spite of its smallness this type J.01 relay incorporates many of the refinements which are normally only found in high quality full size units. These include a laminated armature and frame, a stainless steel armature shaft, "Oilite" bearings, and buffered contacts. Among the design features (for which provisional patents have been obtained) are rapid operation on both a.c. and d.c., inherent freedom from buzz while operated on a.c., heavy contact pressure, and low coil consumption. The relay is particularly suitable for close stacking in applications where many millions of operations may be required.

Electronic Test Meter

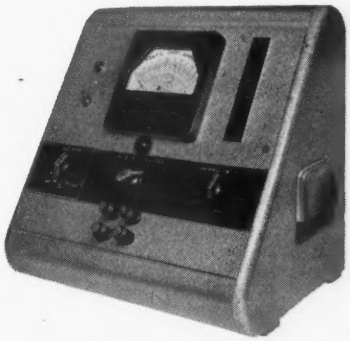
The latest addition to the instruments made by the CLARE INSTRUMENT CO., Rickmansworth, Herts, is an electronic wide range linear scale ohmmeter with d.c. voltage and current ranges. A current range of 0·3 μA full scale is available and voltage ranges up to 30 kV at sensitivities of up to 3·3 MΩ/V can be provided. Quotations are made for individual requirements which may include a.c. voltage and current ranges employing a current transformer and metal rectifier connected to the moving coil instrument. An a.c. voltage sensitivity of up to 5,000 Ω/V can be supplied but the normal sensitivity is 1,000 Ω/V. There are twelve linear scale resistance ranges from 3 Ω to 1 MΩ full scale deflection and five inverse scale ranges from 1 MΩ to 1,000 MΩ.

High-Q Coils

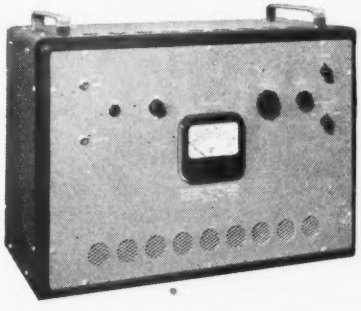
A wide range of ready-wound high-Q inductors is now available from MULLARD, LTD., Century House, Shaftesbury Avenue, London, W.C.2. Most of these are on "Ferroxcube" pot core assemblies and are suitable for use at frequencies from 300 c/s to about 500 kc/s. In due course, additional types will become available which will extend both the frequency and inductance ranges. Owing to the low material hysteresis loss, it is possible, with very high values of inductance, to obtain extremely high values of Q, for example, a Q of 700 at 10 kc/s. In addition to high efficiency, coils on Ferroxcube pot cores have the advantages of compactness and inherent self screening. A 20 henry inductor may be wound on a core with overall dimensions of 1 $\frac{1}{16}$in by 1 $\frac{1}{16}$in by $\frac{3}{4}$in, including all necessary clamping screws.

Electronic Motor Controller

In conjunction with a d.c. motor of roughly 0·1 b.h.p. the electronic motor controller type M.C.31, made by SERVOMEX CONTROLS, LTD., Crowborough Hill, Jarvis Brook, Sussex, gives a range of speeds from 0–6,000 r.p.m. in either direction. The speed is stabilized against changes of mains voltage or frequency, and against changes of applied load, so that the accuracy of control is of a very high order. Moreover, it is a simple matter to provide a range of switched speeds, switching from one to another either by hand or automatically. Each speed then "comes up" in about 0·1 sec, with an accuracy of 2–5 r.p.m. according to the nature of the load. Practical uses for this system are testing of speedometers, and for viscosity control systems.



Clare electronic multi-range meter



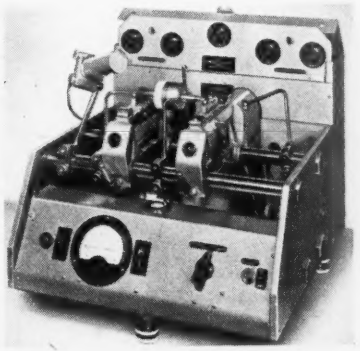
Servomex electronic motor controller

F.H.P. Motors

A new range of fractional horse-power a.c. motors similar in appearance to the present G.E.C. designs but more compact and of less weight, has been produced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The new motors which comply with B.S. 2048: 1953 "Dimensions of F.H.P. Motors" are mechanically interchangeable with other makes complying with this specification. Apart from the flange-mounted motors, they are also interchangeable with American motors made to the American N.E.M.A. standard.

Balancing Machines

Two balance testing machines have just been introduced by E.M.I. ENGINEERING DEVELOPMENT, LTD., Hayes, Middlesex. The equipment is simple and positive in use. The rotor to be balanced is supported in the open bearings of two freely-



E.M.I. high power industrial stroboscope

suspended cradles and belt driven by an electric motor. Any unbalance produces an electrical signal which flashes a stroboscopic lamp and illuminates the workpiece under test. It thus appears stationary, with the position of the unbalance indicated against a pointer; at the same time a meter indicates the amount of unbalance.

The Type 1 machine takes loads up to 30 lb with a maximum diameter of 11in and maximum length between bearings of 14in. The balancing speed range is 1,000 to 2,500 r.p.m. The Type 2 machine has a similar speed range, but the other maxima are: weight of load 7 lb, diameter 4in, and length between bearings 8$\frac{1}{2}$in.

Infra-Red Heater

The introduction of a new infra-red heating unit suitable for the rearing of pigs and chickens is announced by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4. It consists of a porcelain holder, metal reflector and a 250 W direct mains operation infra-red lamp with a pearl finish, in place of the usual series burning clear lamp.

The development of this lamp obviates the need to operate two units in series. Replacement lamps are obtainable at 9s 8d and the complete unit is priced at 23s 6d.

Financial Section

STOCKS and SHARES

A CERTAIN amount of irregularity has again been apparent in Stock Exchange markets, but the undertone remains reasonably confident. Government securities have been inclined to move upwards. Industrials have, on the average, at least held their ground, with the price indices still very near the highest points ever notched. The effect of some of the political news has been roughly balanced by more encouraging company announcements of the kind produced earlier by I.C.I. in increasing the interim dividend for the current year.

The irregular tendency in recent price movements is exemplified by the past week's rise of 2s 6d in G.E.C. ordinary, and the fall of a similar amount in English Electrics. Babcock & Wilcox have been outstanding with an improvement of 3s 9d. Advances were made also by Reyrolles, Lucas, Thornycroft and Telegraph Condenser. Electric Constructions were marked up to 63s 9d in belated recognition of the scrip issue proposal. Brook Motors were quoted ex the one-for-seven share distribution. Of the changes in the reverse direction, Hoovers receded 1s further, and Aberdare Cables lost 9d of the substantial rise induced earlier by the raising of the interim dividend. Lower prices were quoted for Siemens, Telegraph Construction, Johnson & Phillips, Automatic Telephone and a few others.

Chloride New Shares

Early dealings in the newly repatriated "A" shares in Chloride Electrical Storage took place around 64s 3d. The offer of these 1½ million shares at 63s was reported to have been comfortably oversubscribed. Present dealings are in the form of allotment letters, and purchases can therefore be made free of the 2 per cent stamp duty: this accounts for the quotation of the shares at 1s or so above the price of the old shares, with which they rank equally for future dividends. Regarding the latter, market estimates remain at a total of 15 per cent for the current year, as against the equivalent (on the present capital) of 12½ per cent paid for 1953. At the larger rate, the yield on the shares would be a little under 4¼ per cent.

Morphy-Richards Results

Final dividend of 25 per cent declared by Morphy-Richards is at the rate forecast at the time of the one-for-two scrip distribution of last March. The reported expansion by nearly half in the net earnings for 1953–54 satisfies very fully the expectations raised by the company's statement, made on the same occasion, to the effect that sales were rising in both home and export markets. Having already doubled in value, during the course of this year, in anticipation of results such as these, the 4s shares were little further altered

The Week's Price Changes

Company or Board	Nom. Value	Middle price 4th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	95½		3	3	3 2 10	97	88⅞
Brit. Elec. 1974/77	100	95		3	3	3 3 2	96½	87½
Brit. Elec. 1976/79	100	101½		3½	3½	3 9 0	101½	93 3/16
Brit. Elec. 1974/79	100	109		4¼	4¼	3 18 0	111½	103 3/16
Overseas Electric Supply								
Calcutta Elec.	£1	23/-	−6d	6†	6†	5 4 4†	24/6	18/7
East African Power	£1	22/-		7	7	6 7 3	23/4	19/6
Nigerian Elec.	£1	24/-		10	10	8 6 8	25/-	23/6
Palestine Elec. "A"	£1	21/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	16/6	+1/9	Nil	6	7 5 6	16/6	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/-	−9d	25	12½†	4 16 3	13/9	8/1
Aerialite	1/-	13/9		88⅛	88⅛	6 8 6	14/-	10/9
Allen, W. H.	£1	77/-		15	20	5 4 0	77/-	50/-
Aron Elec. Ord.	£1	52/6		20	15	5 14 3	53/9	43/-
Assoc. Elec. Ord.	£1	56/3		20	11¼*	4 0 0	61/6	41/6
Automatic Tel. & El.	£1	71/3	−1/3	15	15	—	73/-	57/3
Babcock & Wilcox	£1	67/6	+3/9	18	12*	3 11 3	67/6	47/3
Baldwin, H. J.	2/-	5/-	+3d	20	20	8 0 0	5/6	3/9
Bakelite	10/-	26/3		12½	12½	4 15 3	27/6	23/6
British Aluminium	£1	37/6		12	10	5 6 8	40/-	33/9
B.I. Callender's	£1	46/6		10	10	4 6 0	48/-	37/9
B.I. Callender's 6% Pref. ...	£1	26/3		6	6	4 11 6	26/6	24/3
British Thermostat	5/-	25/9	−6d	35	27½*	—	26/3	12/-
British Vac. Cleaner	5/-	13/6		25	25	9 5 3	14/6	11/6
Brook Motors	10/-	44/6xc		20	20*	4 10 0	44/6	29/3
Brush Ord.	5/-	8/3		4	6	3 12 9	8/3	3/6
Bulgin, A. F.	1/-	3/6		30	30	8 11 6	3/7	3/2
Burco	5/-	18/9	+9d	35	35	4 13 4*	18/9	12/1
Chloride El. Storage	£1	63/9		20	12½*	3 18 7	68/-	46/6
Clarke Chapman	£1	70/-		17½	20	—	73/-	47/6
Cole, E. K.	5/-	34/6	+2/6	25	27½	3 19 9	38/9	22/6
Cossor, A. C.	5/-	9/6		10	10	5 5 3	11/-	7/-
Crabtree	10/-	28/3	−6d	17½	17½	6 4 0	29/6	23/9
Crompton Parkinson Ord. ...	5/-	18/6	−6d	11½	20	5 8 0	19/6	14/-
De La Rue	5/-	18/9		Nil	20	5 6 8	21/-	12/3
Decca	4/-	47/6	+1/6	150	35*	—	47/6	32/-
Desoutter	5/-	23/9		18	20	4 4 3	23/9	16/1
Dewhurst	2/-	7/-		19	19	5 8 6	6/6	5/1
Dictograph Tel.	2/-	7/-	−3d	20	20*	5 14 0	8/-	5/2
Dubilier Condenser	1/-	4/3		25	25	—	5/3	3/3
E.M.I.	10/-	20/6	−3d	12	8	3 18 0	23/-	11/3
Electrical Components	5/-	16/3		20	20	6 3 0	16/3	10/9
Elec. Construction	£1	63/9	+1/9	15	15	4 14 0	63/9	53/-
Enfield Cable Ord.	£1	22/6		5	Nil	Nil	25/9	16/6
English Electric	£1	55/-	−2/6	15	10*	3 12 9	59/-	38/-
English Electric 3¾% Pref. ...	£1	16/9		3¾	3¾	4 9 7	16/9	15/3
Ericsson Tel.	5/-	30/3	−1/-	22†	25†	2 1 4*†	31/3	22/9
Ever Ready	5/-	25/3	+6d	35	40	—	26/3	17/9
Falk Stadelmann	£1	40/-		15	15	7 10 0	41/-	36/6
G.E.C. Ord.	£1	52/6	+2/6	11¼	12½	4 15 0	53/-	37/6
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/3	26/6
General Cables	5/-	17/3		30	30	8 14 0	17/3	16/3
Greenwood & Batley	£1	51/3		17½	17½	6 16 6	51/3	40/3
Hackbridge Cable	5/-	14/9		20	20	6 15 6	15/9	11/3
Hackbridge & Hewittic	5/-	22/6		20	25	5 11 0	23/3	16/10
Hall Tel. Acc.	10/-	12/-	−1/-	10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/6		12½	12½	4 11 0	5/6	4/-
Henley's ... ... • ...	10/-	19/3	−6d	10½	10½	5 9 0	20/3	15/6
Holophane	5/-	17/6		20	20	5 14 3	17/6	13/1

• After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

after the news at around 24s 6d. Allowing for the fact that the 15 per cent interim dividend for the latest year was paid before the scrip issue, the total distribution is equivalent to 35 per cent on the present capital, and on that rate the yield works out at 5¾ per cent. According to the preliminary figures, the net ordinary and preference dividends involve the distribution of £39,000 out of a net surplus of £104,000.

...in Electrical Investments

Company or Board	Nom. Value	Middle price 4th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	43/9	−1/-	25	45	5 2 10	51/-	26/3
I.C.I.	£1	39/6	−6d	13	15	3 16 0*	40/3	26/6
Intl. Combustion	5/-	29/3		15	20	3 8 6	30/-	14/6
Johnson & Phillips	£1	48/9	−2/6	15	15	6 3 0	52/6	47/6
Lancashire Dynamo	£1	57/6	−6d	12½	14	4 17 9	59/6	43/-
Laurence, Scott	5/-	22/6		15	20	4 9 0	25/-	14/-
Lister, R. A.	£1	33/-		9	12	—	33/-	22/6
London Elec. Wire	£1	51/3		15	10*	3 18 0	51/3	38/-
Lucas, J.	£1	41/3	+1/6	9¼	10½	—	41/6	25/3
Marryat & Scott	2/-	7/9		22½	25	6 9 0	7/9	5/11
Mather & Platt	£1	48/-	+6d	12½	15	—	48/-	32/-
Metal Industries	£1	33/6		12	9	5 7 6	42/3	29/6
Midland Elec. Mfg.	£1	69/-	+1/6	15	15	4 9 0	67/6	63/-
Morphy-Richards	4/-	24/6	+6d	40	35*	5 14 3	25/-	11/4
Murex	£1	49/-		15	15	6 2 6	57/-	49/-
Newman Ind.	2/-	2/4½		10	10	8 8 5	2/6	2/-
Oldham & Son	1/-	3/3		17½	17½	5 7 8	3/4	2/5
Parnall (Yate)	5/-	11/-		6	8	3 12 9	11/-	4/3
Parsons, C. A.	£1	55/-		12½*	7½*	2 14 6	60/-	38/1
Plessey	10/-	55/-	−1/-	25	30	—	58/9	37/10
Pye Deferred	5/-	30/6	+1/9	20	20*	3 5 7	32/6	15/7
Revo	10/-	14/-		27½	9*	6 8 6	20/3	14/-
Reyrolle	£1	87/6	+2/6	12½	13¾	3 2 9	92/6	66/-
Rheostatic	4/-	15/-		19	20	5 6 8	15/9	11/-
Richardsons Westgarth	5/-	11/9		15	15*	6 7 8	12/3	6/6
Scottish Cables	4/-	21/6	−3d	20	27½	5 2 3	21/9	12/11
Siemens Ord.	£1	36/-	−1/6	10	10	5 11 1	43/9	33/9
Smith (England), S.	4/-	13/9	+3d	12½	15	—	14/-	7/8
Southern Areas	£1	24/6		6	7½	6 2 6	27/6	17/6
Strand Elec.	5/-	9/3		17½	17½	9 9 3	9/3	8/3
Sturtevant	5/-	45/-		18·1†	18·9*†	2 2 0†	45/-	29/-
Sun Elec.	£1	33/9	+1/3	15	15	8 17 9	33/9	27/6
Switchgear & Cowans	5/-	12/-	−9d	22½	10	4 3 4	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½*	5 13 9	12/4	10/7
T.C.C.	10/-	36/3	+1/3	20	30*	—	36/3	21/3
T.C. & M.	£1	33/-	−6d	10	8½*	5 3 0	34/6	30/3
Telephone Mfg.	5/-	9/6		10	10	5 5 3	9/6	7/6
Thorn Elec.	5/-	26/-		12½	20	3 17 0	27/-	13/3
Thornycroft	£1	44/-	+1/-	15	15	6 16 3	47/6	33/4
Tube Investments	£1	75/-		15*	15	4 0 0	75/-	60/3
Vactric	5/-	15/9	−1/3	Nil	10	3 3 6	18/9	7/6
Veritys	5/-	9/3		10	12½	6 15 2	9/3	5/-
Walsall Conduits	4/-	51/3		70	70	5 9 4	52/6	44/-
Ward & Goldstone	5/-	39/-		45	50	—	39/6	21/-
Watford	2/-	7/-		25	22½*	—	7/3	4/7
Westinghouse Brake	£1	73/9		14	15	4 1 4	77/-	60/9
West, Allen	5/-	16/9		15	17	5 1 6	16/9	12/7
Wolf Electric	5/-	16/3		15	17½	5 7 9	14/9	11/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	86		—	6	6 19 6	89½	80
Ord.	100	54½		—	3	6 17 6	55½	52
Anglo-Portuguese	£1	25/-	+9d	—	8	6 8 0	25/-	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	63/9	−9d	35	50	3 18 6	65/-	39/1
Cable & Wireless:								
Ord.	£1	43/-	+1/-	8	9	4 3 9	49/6	26/2
4% Loan	100	98½		4	4½	4 1 3	98½	95½
Calcutta Trams	£1	21/6		2½†	6†	5 11 6†	24/6	17/1
Cape Elec. Trams	£1	15/6		5½	7	9 13 6	17/6	12/4
Marconi Marine	£1	34/-	+1/3	10	10	5 17 8	34/-	27/6
Oriental Tel. Ord.	£1	92/6	+2/6	16	16	—	95/-	82/6
Telephone Props.	£1	5½	+2/6	8	8	—	5½	4½
Telephone Rentals	5/-	10/-		10	10	5 0 0	10/6	9/-

British Electric Resistance

Final dividend and annual results of the British Electric Resistance Co., which closes the accounts in July, are expected to be announced by the end of this month. The 2s shares have changed hands recently at 3s 7½d. For some years the company has made distributions totalling 20 per cent, and, with earnings in the ascendant, an additional 5 per cent was paid on each of the last two occasions. In the current year, there has been a share-for-share capitalization issue, and an interim of 2½ per cent, which was equivalent to the previous corresponding payment. If the total for this period is to be made up by the final dividend to 12½ per cent, the yield on the shares will work out at about 6¾ per cent.

Preference Shares

Telegraph Construction & Maintenance 5 per cent preference shares, issued a few months ago, have been available lately in fairly large numbers at 21s, to yield 4¾ per cent. Hackbridge Cable 5 per cent preference have been offered on similar terms. The 5½ per cent preference stocks of Murphy Radio and British Vacuum Cleaner could be bought respectively at 20s 9d (yield 5·3 per cent) and 18s 6d (yield 5·9 per cent). A.E.I. 4½ per cents at 20s 6d and Reyrolle "fours" at 18s 6d show returns of a fraction under 4½ per cent. On Broadcast Relay 4 per cents at 16s 7½d the return is £4 16s 3d per cent.

"Tele. Props." Dealings

Shareholders in Telephone Properties are called upon to decide whether to remain with the company in its new character of an investment trust, or to exercise the right to transfer up to three-quarters of their holdings to a new realization company. The latter is being formed (subject to the receipt of sufficient support) to satisfy those shareholders who thought that the preferable course would be for the company to distribute the proceeds from the sale of the operating subsidiary. For the present it is necessary for dealings to take place in shares of three descriptions. For "assented" shares (those whose holders have elected to remain in Telephone Properties) dealings have been taking place around 87s; for the "R" shares (the result of the alternative offer) at 110s; and for "non-assented" (on which no decision has yet been notified) at 103s 6d.

Radio Shares

In the market for radio shares some prices are under the recent all-time peaks, but they continue to reflect active interest and confident support. The July retail sales figures, being well up on previous figures, have apparently led to expectations that last year's record of 1·1 million T.V. sets sold will be easily beaten.

REPORTS and DIVIDENDS

Morphy-Richards, Ltd.—The group profit for the year to 30th June last, subject to final audit, is £320,601, as compared with £187,733 for the preceding year. After deducting £30,361 for depreciation and £186,578 for taxation, there is a group net profit of £103,862 (against £75,377), of which £92,351 (£66,592) is attributable to the parent company. It is proposed to pay a final dividend of 25 per cent (same) on ordinary stock increased by a bonus issue to £181,500 from £121,000, making a total distribution for the year of 40 per cent (unchanged).

The directors have given notice to the holders of the 6 per cent redeemable convertible preference shares to redeem on 31st December next, the whole of the 113,361 shares outstanding. Preference shareholders have the right to convert their holdings into ordinary shares of 4s each at the current conversion price of 15s 9½d per ordinary share.

Stothert & Pitt, Ltd.—The accounts for the year to 30th June last show that after deducting £305,935 for taxation, the profit is £325,476, as compared with £296,851. The equipment reserve receives £223,211, and it is proposed to pay a final dividend of 12½ per cent, maintaining the distribution for the year at 17½ per cent on the capital as enlarged to £650,000 by a scrip issue in November last of five-for-eight. A provision of £42,500 has been made as a reserve for a special bonus to employees, and a balance of £95,413 is carried forward (against £103,604 brought in).

The Chloride Electrical Storage Co., Ltd.—Lazard Brothers & Co., Ltd., announce that applications for approximately 1,750,000 stock units were received in response to their offer of £1,573,688 "A" ordinary stock of the Chloride Co. at 63s per stock unit. Applications from stockholders of the company made on special forms will be accepted in full. Those on ordinary forms will be accepted in full up to 1,000 stock units, and for the larger applications the general basis of acceptance will be about three-quarters of the amount applied for.

Peter Brotherhood, Ltd., report a profit for the year ended 31st March last of £174,904 (against £138,546), after allowing £260,950 (£179,000) for taxation. The final ordinary dividend of 22 per cent (against 13 per cent) raises the total distribution for the year to 30 per cent (against 18 per cent).

Ebonite Containers, Ltd., proposes to pay a final dividend of 12½ per cent (against 13 per cent), making 17½ per cent for the year (unchanged) on increased capital.

The British Aluminium Co., Ltd., has declared an interim dividend of 4 per cent (unchanged).

New Companies

Busby Electrical Co., Ltd.—Registered 24th September. Capital £1,000. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, radio and television sets, etc. Directors: V. H. Busby, Mrs. May Busby and R. C. Busby. Regd. office: 66, Heath Park Road, Romford, Essex.

L. Wilkinson (Croydon), Ltd.—Registered 25th September. Capital £5,000. Manufacturers and repairers of and dealers in electrical and radio and television and electronic and mechanical apparatus and accessories, etc. Directors: L. Wilkinson and Ena M. Wilkinson. Regd. office: 19, Lansdowne Road, Croydon, Surrey.

Glenbrook Industries, Ltd.—Registered 27th September. Capital £500. Electrical and mechanical engineers and contractors, etc. R. H. Duthie signs as director. Solicitors: Swatton Hughes & Co., 18a, Broadwalk, North Harrow.

Newgate Electrical, Ltd.—Registered 25th September. Capital £2,000. Mechanical and electrical engineers, etc. Directors: R. Anderson and Mrs. Winifred E. Anderson. Regd. office: 11, Savile Row, Newcastle-on-Tyne, 1.

Marlow Electrical Co., Ltd.—Registered 25th September. Capital £1,200. To acquire the business of an electrical engineer and contractor carried on by I. Merwitzer at Manchester, 3, as Marlow Electrical Co., etc. Directors: I. Merwitzer and Mrs. Joan R. Merwitzer. Regd. office: 7, Bridge Street West, Manchester, 3.

Morley & Sons (Electrical), Ltd.—Registered 11th September. Capital £500. Electrical engineers and general electrical installation contractors, etc. Directors: J. N. Morley and Mrs. Joan E. Morley. Regd. office: 109, Kenton Park Crescent, Kenton, Harrow.

Solartron Research and Development, Ltd.—Registered 11th September. Capital £100. Electronic, electrical, mechanical, telegraphic, telephonic, radio, television and general engineers, etc. Directors: L. B. Copestick, J. E. Bolton, E. R. T. Ponsford and J. E. Crosse. Regd. office: Solartron Works, Queens Road, Thames Ditton, Surrey.

Anderson & Son, Ltd.—Registered 20th September. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: J. A. Anderson and Mrs. Simone Anderson. Regd. office: 41, Brockley Rise, S.E.23.

Engineering Equipment (Western), Ltd.—Registered 17th September. Capital £3,000. Agents for the supply of electrical equipment and apparatus, etc. Regd. office: 24, Moorland Road, Weston-super-Mare, Som.

Wulfruna Refrigeration Services, Ltd.—Registered 18th September. Capital £2,000. Electrical and refrigeration engineers, suppliers of electrical and refrigeration equipment, etc. Directors: J. A. Risi and A. B. Risi. Regd. office: 232, Steelhouse Lane, Wolverhampton.

Increases of Capital

Pye, Ltd.—Increased by £250,000, in 5s "A" deferred ordinary shares, beyond the registered capital of £2,000,000.

Pye Industrial Electronics, Ltd.—Increased by £29,900, in £1 ordinary shares, beyond the registered capital of £100.

Thames Wire & Cable Co., Ltd.—Increased by £25,000, in £1 ordinary shares, beyond the registered capital of £25,000.

Siemens-Schuckert (Great Britain), Ltd.—Increased by £20,000, in £1 ordinary shares, beyond the registered capital of £30,000.

Mather & Platt, Ltd.—Increased by £3,500,000 in 1,363,660 ordinary and 2,136,340 unclassified shares of £1, beyond the registered capital of £2,500,000.

Watsham's, Ltd.—Increased by £25,000 in £1 ordinary shares, beyond the registered capital of £25,000.

Ward & Goldstone, Ltd.—Increased by £200,000, in 5s ordinary shares, beyond the registered capital of £300,000.

Liquidation

G. & W. Components, Ltd., manufacturers of conduit electrical fittings.—Winding up voluntarily. Liquidator, Mr. W. P. Barnfield, Barclays Bank Chambers, The Bridge, Walsall, Staffs, appointed 16th September.

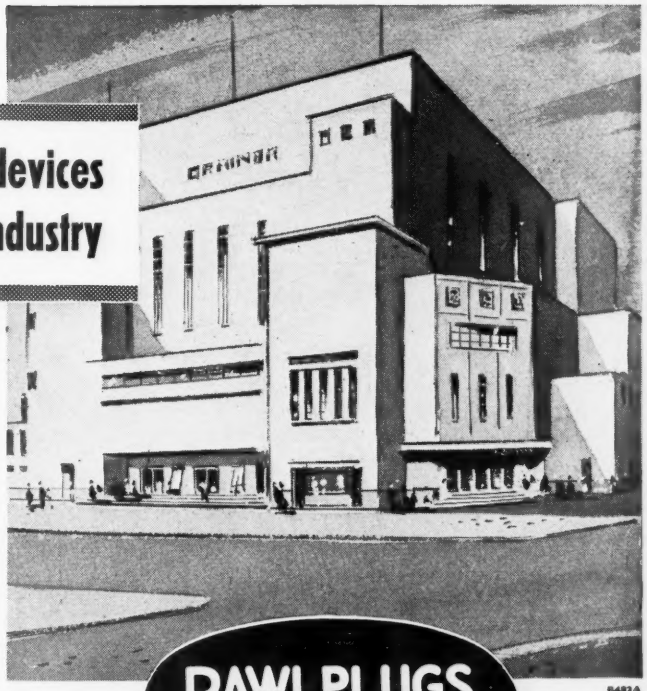
Industrial Films

Two new industrial films were shown last week to a gathering of electrical engineers, and others interested in the use of copper, at the National Film Theatre.

"The 'Yorkshire' Point of View" is entirely different from previous "Yorkshire" films; it is in full, natural colour and seeks to tell the observer how all members of the Yorkshire Copper Works, Ltd., cooperate to produce something of which the company is proud. The film introduces many new and complex machines and testing equipment, and the development and technical engineers who are constantly watching over them and developing new ideas to increase and improve production. We obtained an impression of the thoroughness of training which supervisors, foremen and workpeople receive in new techniques and methods, the extreme care taken in testing and inspection, and the up-to-the-minute mechanical handling devices employed at the works at Leeds and Barrhead.

"The Plumbers' Way" takes the subject out of the lecture room and into the atmosphere of practical plumbing "on the job," whereby each member of the audience, with the help of 3-D, looks over the shoulder of a craftsman plumber at work, to see how he does the job—with "Yorkshire" tubes and fittings. But the main appeal of the film is not only to plumbers, builders, water and heating engineers, but, in fact, every craftsman must be interested in it. The special points of appeal lie, however, in the basic principle of the capillary joint—with some interesting and ingenious pictorial explanations; in the principal operations used in the "Yorkshire" system; and in a general idea of the field of operation of the "Yorkshire" system.

Millions of Rawlplug fixing devices are used in the electrical industry



Whether you are wiring a cinema or plain work-a-day machine shop, Rawlplug Fixing Devices get the job done in far less time than by any other method. With them you take modern building materials in your stride. Hollow floors, acoustic panels, cavity walls, sheet metal partitions, for these and for plain brick, stone and concrete there's a Rawlplug Fixing Device (screw or bolt) that makes the job simple and straightforward. Check every fixing job with your Rawlplug Catalogue. You'll save time and money and get neater, stronger fixings too!

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Write our Technical Dept. about your fixing problem.

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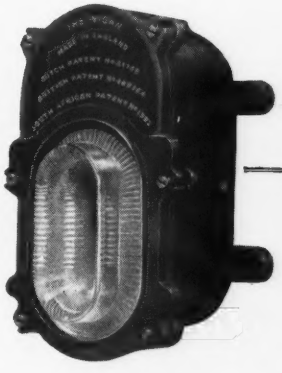
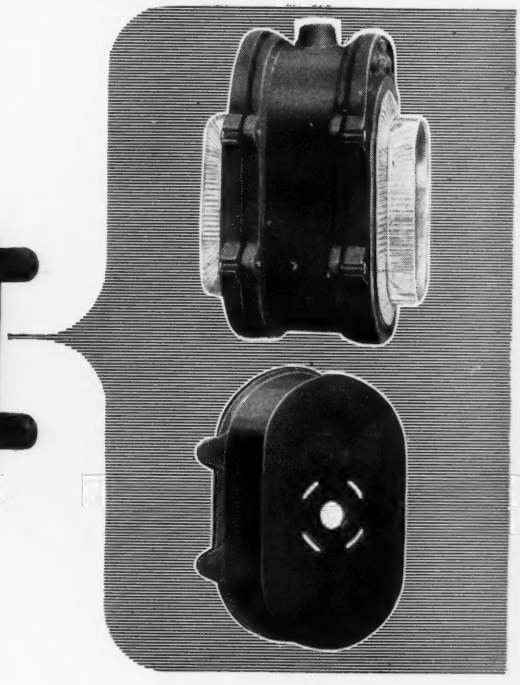
Prismatic FITTINGS

FOR TUNGSTEN FILAMENT LAMPS UP TO 150 W





Robust in construction and affording maximum illumination the wide range of Wigan Prismatic fittings holds the answer to every industrial lighting problem. We illustrate here a selection—

- *Cat. No.* 330. *Through type with Rubber Packing Joints for* 100/150 *watt lamps.*
- *Cat. No.* 331. *Double-sided fitting with Rubber Packing Joints for use in single brick walls, etc.*
- *Prismatic fittings are also made for B.S.*1· *box attachment in sizes up to* 150 *watts.*

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HEYES & CO. LTD. WATER HEYES ELECTRICAL WORKS, WIGAN

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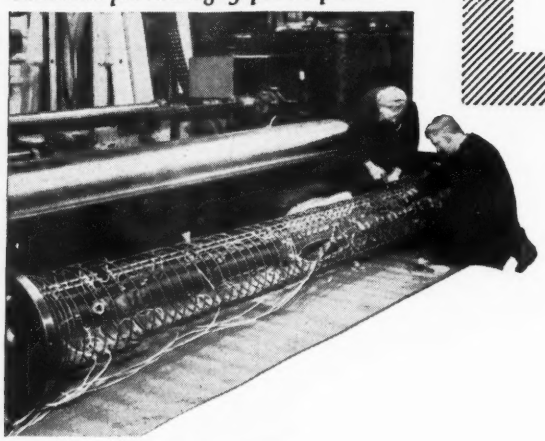
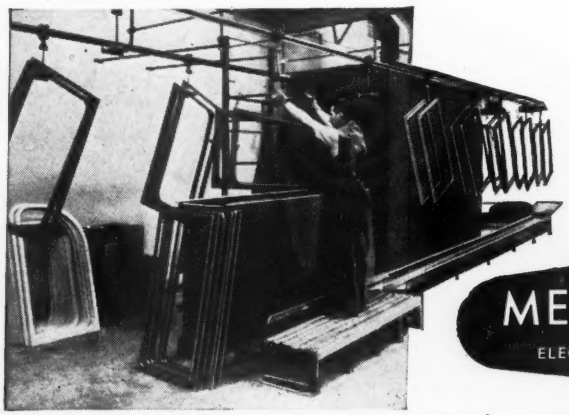
METROVICK FOR ALL INDUSTRIAL HEATING

Dielectric pre-heating of plastic pellets.



Tubular-element Roller Heater.



Infra-red paint stoving of window pans.

Whether you make cars or castings, buses or buttons, you can speed production while saving time and money by the use of Metrovick heating for all industrial processes. Accelerated drying of paints and varnishes ; industrial elements ; dielectric heating of powders. . . . These are typical of hundreds of uses for Metrovick heating equipment. M-V engineers will gladly advise on the most suitable installation for your works.

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Member of the A.E.I. group of companies.

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NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 11th October

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Some Design Features of the Semi-Outdoor Power Station at Ince," by F. H. S. Brown.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. Chairman's Address, by E. Hywel Jones, followed by films on "Operational Problems of a Generating Division."

CHELMSFORD. — Public Library Lecture Room, Duke Street, 7.30 p.m. Institute of Industrial Supervisors, Mid-Essex Section. Presidential Address, by R. Telford.

DUNDEE.—Mathers Hotel, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. Film: "Materials Handling."

LEICESTER.—Demonstration Theatre, Electricity Offices, Charles Street, 7 p.m. Leicester Electrical Society. "Electrical Equipment in a Modern Airliner."

LIVERPOOL.—At the Liverpool Royal Institution, Colquitt Street, 6.30 p.m. I.E.E., Mersey and North Wales Centre. Chairman's Address, "Cables—some Post-War Trends," by P. R. Dunn.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Students' Section. Chairman's Address, "The History of the Institution," by M. C. Cubitt.

Strand Electric Showrooms, 7 p.m. A.S.E.E. Central London Branch. "Theatre Lighting."

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. Chairman's Address, by G. W. B. Mitchell.

NORWICH.—Assembly House, 7.30 p.m. I.E.E. district meeting. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

SHEFFIELD.—I.E.S. Sheffield Centre. Chairman's Address, by C. J. Chisholm.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. Annual general meeting and Chairman's Address, "Furnace Construction," by F. Goldsbrough.

Monday, 11th October, to Friday, 15th October

LONDON.—Seymour Hall. London Nursing Exhibition and Professional Nurses' and Midwives' Conference.

Tuesday, 12th October

BELFAST.—Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. Chairman's Address, "Recent Telecommunication Developments in Northern Ireland," by Major P. L. Barker.

BRADFORD.—Y.E.B., Sunbridge Road, 7 p.m. I.E.E. North Midland Students' Section. Sheffield Exchange Paper, "X-rays," by R. D. Roper.

BRISTOL.—R.W.A. School of Architecture Library, 6.30 p.m. Institution of Heating and Ventilating Engineers, South Western Branch. "Heated Aluminium Ceilings," by H. C. Jamieson.

CAMBRIDGE.—Cambridgeshire Technical College, 6 p.m. I.E.E. Cambridge Radio Group. Chairman's Address, by G. E. Middleton.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "The Teaching of the Subject of Electromagnetism," opened by Dr. K. J. R. Wilkinson.

Connaught Rooms, 12.30 for 1 p.m. Electrical Industries Club. Luncheon. Speaker, H. A. R. Binney.

At the Royal Institution, Albemarle Street, 6 p.m. Illuminating Engineering Society. Presidential Address, "Lighting and Electricity Supply," by E. C. Lennox.

At the Institution of Electrical Engineers, Savoy Place, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. Chairman's Address, "The Organization of the E.T.E.," by W. F. Smith.

LOUGHBOROUGH.—Loughborough College, 6.30 p.m. I.E.E. East Midland Centre. Chairman's Address, by Dr. J. H. Mitchell, and annual general meeting.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilization Group. "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," by J. W. Bunting.

NEWPORT.—Flying Services Club, 28, High Street. Newport and District Electric Club. "Refinery Power Services," by G. D. Curtis.

STOKE-ON-TRENT.—M.E.B., 31, Kingsway, 6 p.m. I.E.S. Stoke-on-Trent Group. "Lighting at Home and Abroad," by A. D. Charters.

Tuesday, 12th October, and Wednesday, 13th October

LONDON.—4, Grosvenor Gardens. Iron and Steel Institute. Joint meeting with the National Forgemasters' Association and the Chambre Syndicale de la Grosse Forge Fancaise. Discussion of Technical Papers.

Wednesday, 13th October

ABERDEEN.—Caledonian Hotel. I.E.E. North Scotland Sub-Centre. Inaugural dinner and Chairman's Address, by J. E. Whittaker.

BIRMINGHAM.—Chamber of Commerce, New Street, 7 p.m. A.S.E.E. Birmingham Branch. "Carbon in Industry," by M. W. Howard.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Conquest of Power," by R. J. Steele.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Chairman's Address, by C. W. Oatley.

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North-Eastern Section. "Radio Production," by H. G. Wood.

NORTHAMPTON.—College of Technology, 7.15 p.m. Northampton and District Electrical Association. "The National Grid," by R. A. Bartlem.

OXFORD.—37, George Street, 7 p.m. I.E.E. district meeting. "Traction-Electrification of British Railways," by W. E. Marrian.

SOUTHAMPTON.—The University, 6.30 p.m. I.E.E. Southern Centre. "Electric Lifts in Post-War Housing," by C. G. L. Morley.

YORK.—The Picture House Cafe, Coney Street, 7.15 p.m. A.S.E.E. York Branch. "Ball and Roller Bearings."

Thursday, 14th October

CHATHAM.—Central Hall, 7 p.m. Incorporated Plant Engineers, Kent Branch. Discussion on "Air Pollution."

DUNDEE.—University College, 7 p.m. I.E.E. North Scotland Sub-Centre. Chairman's Address, by J. E. Whittaker.

HULL.—Y.E.B., Ferensway, 7.15 p.m. I.E.E. North Midland Centre, district meeting. "Fluorescent Discharge-Tube Circuits and Operating Problems," by J. Cates.

LONDON.—Dorchester Hotel, Park Lane, W.1, 7 for 7.30 p.m. Institution of Mechanical Engineers. Annual dinner.

At the Institution of Civil Engineers, Great George Street, S.W.1, 5.30 p.m. Institute of Fuel. "Heat Transfer in a Continuous Re-Heating Furnace," by Prof. R. J. Sariant and Dr. D. Smith; "The Significance of Sectional Heat Balances and Burner Performances in Furnaces," by Prof. R. J. Sarjant and Dr. N. P. Bacon.

MANCHESTER.—N.W.E.B., Town Hall, 6 p.m. I.E.S. Manchester Centre. "The Social Significance of Lighting," by W. T. O'Dea.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North-East Branch. "The Classification of Fire Hazards," by D. McClean.

PLYMOUTH.—Electricity Showrooms, Prudential Buildings, New George Street, 3 p.m. I.E.E. South-Western Sub-Centre. Chairman's Address, by H. C. O. Stanbury.

SWANSEA.—S.W.E.B. Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Chairman's Address, G. D. Curtis.

Friday, 15th October

LONDON.—Caxton Hall, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "Electronic Development Applied to Microscopy," by W. Burrells.

Pepys House, 14, Rochester Row, 7 p.m. Junior Institution of Engineers. "Problems Relating to Meter and Instrument Bearings," by G. F. Shotter.

1, Birdcage Walk, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. Presidential Address, by Dr. R. W. Bailey.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Metals—their Use and Testing," by L. E. Benson.

Café Royal, Peter Street. Institution of Heating and Ventilating Engineers, Manchester and District Branch. Ladies' evening.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 15th October:

AARCON (design). No. 716,681, Class 7. Electric motors (not for land vehicles), pumps included in Class 7, compressors (machines), and parts of all these goods.—Air Conditioning & Refrigeration, Ltd., Nassau, Bahamas. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

THORN ELECTRICAL INDUSTRIES, LTD. (design). No. B644,049, Class 9. Electric flat irons and electric starting and current controlling devices for discharge lighting.—Thorn Electrical Industries, Ltd., 105–109, Judd Street, London, W.C.1.

BONATA. No. 730,657, Class 9. Scientific, nautical and surveying apparatus and instruments; electrical apparatus and instruments included in Class 9; and radio, photographic, cinematographic and optical apparatus and instruments.—J. J. Silber, 51–54, Avenue Chambers, Vernon Place, London, W.C.1.

VACRELAY. No. 732,212, Class 9. Electric relays, and parts included in Class 9.—R. G. Dixon (Worthing), Ltd., 25, Wordsworth Road, Worthing, Sussex.

POLYCONE. No. 730,684, Class 9. Electric flexibles, insulated electric wire and electric cables; and electricity conductors.—Concordia Electric Wire & Cable Co., Ltd., Trent Mills, Derwent Street, Long Eaton, near Nottingham.

SUPERTHANE. No. 729,339, Class 17. Insulating materials.—W. T. Henley's Telegraph Works Co., Ltd., 51–53, Hatton Garden, London, E.C.1.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 10th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1950

1510. Holmes & Co., Ltd., W. C., Cooper, C., and Sykes, W.—Safety devices for use with electrostatic precipitators in coal-gas manufacture. 18th January, 1951. (718361.)

19193. Soc. d'Electronique et d'Automatisme.—Servo systems responsive to multiple variables. 1st August, 1950. (718280.)

24595. Babcock & Wilcox, Ltd.—Mixed power plants incorporating tubulous vapour generators. 8th October, 1951. (718176.)

24954. Postmaster General.—Signalling apparatus used in automatic telephone exchanges. 12th June, 1952. (718262.)

29757. British Thomson-Houston Co., Ltd.—Germanium pellets. 5th December, 1950. (718265.) 29882. Production of germanium pellets. 6th December, 1950. (718266.)

1951

1546. Postmaster General. — Electrical pulse modulators. 29th February, 1952. (718269.)

2067. British Thomson-Houston Co., Ltd.—Electric control devices. 28th November, 1951. (718366.)

2100. Ionlite, Ltd., and Taylor, H.—Reflector fittings for tubular electric lamps. 28th January, 1952. (718270.)

5909. British Thomson-Houston Co., Ltd.—Electric circuit elements incorporating semi-conductors. 12th March, 1951. (718271.)

8263. Felden Engineering Co., Ltd., and Wyborn, E. J.—Electric lighting fittings for fluorescent discharge lamps. 10th April, 1952. (718181.)

12370. Wotton, C. S. R.—Electrically heated soldering irons. 14th May, 1952. (718370.)

18185. Chromatic Television Laboratories, Inc.—Television scanning systems. 1st August, 1951. (718279.)

18883. General Electric Co., Ltd., Friedlander, E. S., Milner, M., and Gardiner, H. W. B.—Control apparatus for synchronous electric machines. 7th August, 1952. (718023.)

19577. British Thomson-Houston Co., Ltd.—Brightening aluminium. 20th August, 1951. (718024.)

20973. National Research Development Corporation.—Production of electrically conductive films. 1st September, 1952. (718189.)

21535. Standard Telephones & Cables, Ltd.—Selenium rectifiers. 5th September, 1952. (718282.)

22297. British Thomson-Houston Co., Ltd.—Pulse generating circuits. 1st July, 1952. (718191.)

22801. English Electric Co., Ltd.—Electric motor control systems. 26th September, 1952. (718193.)

23940. C.A.V., Ltd.—Electrical door-actuating apparatus. 6th October, 1952. (718379.)

24194. English Electric Co., Ltd.—Electrical measuring or indicating devices. 17th October, 1952. (718286.)

24858. British Thomson-Houston Co., Ltd.—Pulse generating circuits. 27th August, 1952. (718195.)

28423. British Thomson-Houston Co., Ltd.—Overspeed devices. 4th December, 1951. (718383.)

28776. Siemens-Schuckertwerke Akt.-Ges.—Electric amplifying machines. 7th December, 1951. (718197.)

29272. Kelvin & Hughes, Ltd.—Non-destructive testing of solid bodies using ultrasonic vibrations. 13th March, 1953. (718291.)

29289. Smith, Ltd., H., and Smith, H. G.—Fittings for electric lamps. 15th December, 1952. (718384.)

30216. Columbia Broadcasting System, Inc.—Synchronizing apparatus, particularly for colour television. 27th December, 1951. (718123.)

1952

1950. Electric Storage Battery Co.—Microporous material. 24th January, 1952. (718390.)

2108. English Electric Co., Ltd.—Cooling systems for dynamo-electric machines of aircraft. 16th January, 1953. (718200.)

2400. British Thomson-Houston Co., Ltd.—Photo-flash and other lamp caps. 29th October, 1952. (718295.)

2843. Murphy Radio, Ltd. — Radar systems. 2nd February, 1953. (718044.)

2955. General Electric Co., Ltd., and Hamblin, C. L.—Electronic circuits for deriving a voltage proportional to the logarithm of the magnitude of a variable quantity. 4th February, 1953. (718128.)

3156. Loewe Opta Akt.-Ges.—Electrode system for cathode-ray tubes. 6th February, 1952. (718201.)

3278. Metropolitan-Vickers Electrical Co., Ltd.—Electric transformers and the like. 9th January, 1953. (718129.)

3334. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 27th January, 1953. (718394.)

4157. Breakell, C. C., Parker, C. S., and Christopherson, F.—Detecting and recording electrical changes in the body resultant on its physiological processes. 18th May, 1953. (718131.)

4644. Bendix Aviation Corporation.—Ceramic transducer for underwater sound transmission and reception. 21st February, 1952. (718203.)

4732. Standard Telephones & Cables, Ltd.—Ferromagnetic ferrite materials. 13th February, 1953. (718204.)

5813. Automatic Telephone & Electric Co., Ltd.—Automatic telephone systems. 25th February, 1953. (718056.)

6707. Aircraft-Marine Products, Inc.—Electrical connector and method of manufacture. 14th March, 1952. (718206.)

6855. General Electric Co., Ltd., and Peddle, E. A. R.—Electric pulse relaying apparatus utilizing cold-cathode discharge valves. 17th March, 1953. (718058.)

6911. Marconi's Wireless Telegraph Co., Ltd.—Pulsed radar systems. 23rd January. 1953. (718059.)

7001. Item Soc.—Electromagnetic oscillatory motors. 18th March, 1952. (718207.)

9115. English Electric Valve Co., Ltd.—Television and like pick-up tubes. 2nd January, 1953. (718399.)

9706. General Electric Co., Ltd., and Scott, P.—Variable speed electric drive systems. 15th June, 1953. (718141.)

9936. Forges et Ateliers de Constructions Electriques de Jeumont.—D.c. track circuits for railway signalling. 21st April, 1952. (718304.)

10782. Metropolitan-Vickers Electrical Co., Ltd.—Semi-conductors. 29th April, 1952. (718064.)

10866. Allis-Chalmers Manufacturing Co.—Gas blast electric circuit interruptor. 30th April, 1952. (718065.)

11438. Philips Electrical Industries, Ltd.—Dry shaving apparatus. 6th May, 1952. (718145.)

11682. Metropolitan-Vickers Electrical Co., Ltd.—Gas blast circuit breakers. 8th May, 1952. (718401.)

13162. Metropolitan-Vickers Electrical Co., Ltd.—Manufacture of electromagnetically vibrated reeds. 29th April, 1953. (718148.)

14843. British Thomson-Houston Co., Ltd.—Governor controlled electric motor. 12th June, 1952. (718214.)

17693. Benchemoul, N. R.—Liquid electric resistor apparatus. 14th July, 1952 (718320.)

19383. Electrofilm, Inc.—Electric heating elements. 31st July, 1952. (718161.)

19645. Telefunken Ges. für Drahtlose Telegraphie.—Semi-conductor devices. 5th August, 1952. (718323.)

20361. Siemens & Halske Akt.-Ges.—Arrangements for the generation of voltage impulses succeeding one another in time and for testing such voltage impulse generators. 13th August, 1952. (718155.)

20833. Raytheon Manufacturing Co.—Radio echo distance measuring systems. 19th August, 1952. (718085.)

21636. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Apparatus for transforming electrical signals from one scanning standard to another. 28th August, 1952. (718223.)

22653. Bendix Aviation Corporation.—Electrical condenser and method of making same. 9th September, 1952. (718330.)

24757. Carr Fastener Co., Ltd.—Electric contact strips. 24th September, 1953. (718170.)

26058. Forges et Ateliers de Constructions Electriques de Jeumont.—Movable electric bridging switch contacts. 17th October, 1952. (718234.)

26515. Igranic Electric Co., Ltd., and Taylor, J. R.—Electromagnetic clutches. 22nd October, 1952. (718237.)

27191. Kearney Corporation, J. R.—Contact arrangements for electrical disconnect switches. 29th October, 1952. (718343.)

27852. Soc. d'Etudes Electromecaniques.—Automatic electric cut-outs. 5th November, 1952. (718347.)

28242. Erie Resistor Corporation.—Tubular trimmer condenser. 10th November, 1952. (718348.) 28359. Moisture-proof coatings for electrical components. 11th November, 1952. (718349.)

28602. National Cash Register Co.—Electrical impulse counting arrangements. 13th November, 1952. (718159.)

29233. General Electric Co.—Tubing connections. 19th November, 1952. (718350.)

29875/6. Raytheon Manufacturing Co.—Magnetrons. 25th November, 1952. (718088/9.)

31559. Standard Telephones & Cables, Ltd.—Selenium rectifiers. 12th December, 1952. (718354.)

32022. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone systems. 17th December, 1952. (718255.)

32594. Metzner, R. G.—Induction motor. 23rd December, 1952. (718257.)

1953

24980. Ionlite, Ltd., and Taylor, H.—Current supply units for electric lighting fittings. 28th January, 1952. Divided out of 718270. (718358.)

GENERATION AND DEVELOPMENT

Crewkerne Reinforcement

On Friday last Mr. S. F. Steward, C.B.E., chairman of the South Western Electricity Board, switched on a new major supply point at Woodcote, near Axminster. The new 132 kV substation will reinforce supplies throughout an area of some 400 square miles, including Crewkerne, Axminster, Chard and Ilminster, hitherto supplied by 33 kV lines from Bridgwater.

Labrador Scheme Inaugurated

The Menihek Dam, Labrador's first hydro-electric development, was officially inaugurated last month by the Premier of Newfoundland, Mr. Joseph Smallwood, who scaled a narrow catwalk to start up the plant, which is to supply electricity to Canada's biggest iron ore development at Knob Lake, 23 miles away. He predicted that the Newfoundland territory could eventually produce between 15,000,000 and 18,000,000 h.p. The Prime Minister of Canada, Mr. St. Laurent, described the plant as "only a forerunner of a great outstanding development."

The 1,200ft long dam spanning the former river mouth also serves as a bridge for the 356-mile railway line which carries ore from Knob Lake to Seven Islands, Que., for the Iron Ore Company of Canada. Power from the Menihek plant is used for the railway and for the 1,000 employees who live in Knob Lake.

Street Lighting

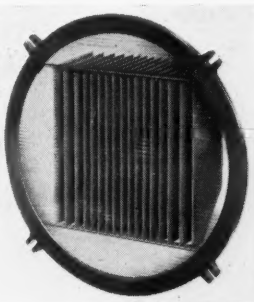
The MIDDLESBROUGH Watch and Licensing Committee has approved street lighting improvement schemes to cost about £11,000. It is proposed to spend £5,230 replacing gas lighting with sodium lighting in Cargo Fleet Lane and a further £2,010 on similar lighting in South Bank Road.

FARINGTON (near Preston) Parish Council proposes to replace 139 gas lamps by 355 electric lamps, including 170 sodium lamps, at a cost of £15,000.

A proposal that all street lighting in LITHERLAND (Lancs.) should be converted from gas to electricity has been referred to a special sub-committee with powers to act.

Work is starting on a £1,500 scheme of BOLSOVER (Derbyshire) U.D.C. to convert existing street lighting from gas to electricity through the centre of the town.

The second stage of the conversion of street lighting from gas to electricity, estimated to cost £3,850, is now to be carried out by WIGSTON (Leics.) U.D.C.



Wellington (N.Z.) Transport Service

The Wellington (N.Z.), City Council has decided to convert the city's tramway system to a trolleybus and diesel bus service in progressive stages. The next stage of development will apply to the city's eastern suburbs.

Expansion in Mexico

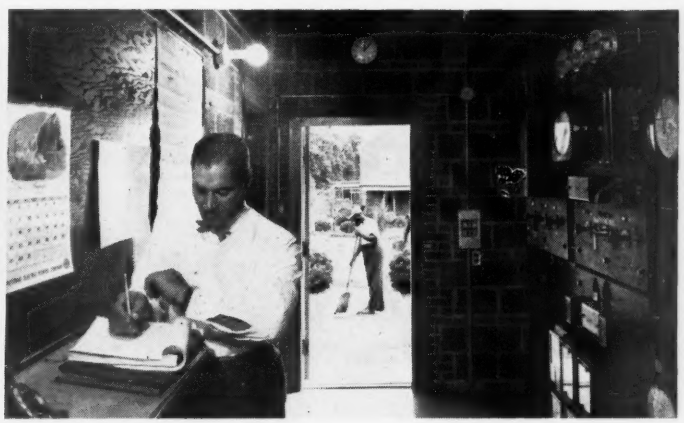
The Mexican Light & Power Co.'s 45,000 kW Patla hydro-electric plant at Puebla is to be brought into operation this month, serving Mexico City and outlying areas. This will make the company's total plant capacity (including energy supplied by the Federal Electrical Commission) 603,000 kW, 305,000 kW being hydro-electric. It is officially stated that in future the company will favour thermal schemes. Present capacity is sufficient to meet existing demands, but the company is planning to extend the supply to new areas. At a press preview of the Patla plant, it was stated that Mexico was already preparing to use atomic energy to produce electricity.

Lighting Railway Platforms

Modified "Mazda 22" 500 W tungsten floodlighting projectors have been supplied to British Railways (Southern Region) for lighting platform extensions built to accommodate ten-car suburban trains in service during rush periods, and too narrow for centrally positioned lighting standards. The new platform floodlight has an internal louvre developed by the B.T.H. Research Laboratory. Mounted behind a horizontally reeded diffuser glass, this gives an accurately controlled distribution of light over the platform without undue spillage into zones where it might dazzle train drivers. Installations of the new fitting have been completed at Charing Cross, New Cross and a number of other stations. In each case projectors are mounted at approximately 30ft above the platform, either one or two at each end of the extension, according to its length.

As an example, at New Cross a platform extension approximately 240ft long has a lighting installation consisting of four special projectors, two at either end.

Part of a platform at Charing Cross Station lighted by special "Mazda" floodlight projectors. Conventional lighting by a row of fittings on lighting standards is used farther down the platform. Inset: Horizontal diffuser glass and vertical louvre used in the special projector



This desirable residence standing in its own grounds at Washington, D.C., is not what it seems. It is one of a number of substations of the Potomac Electric Power Co., housing transformers and switchgear. The right-hand picture shows what might be called the "kitchen" with more control apparatus than is usual

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Ardwick-le-Street.—30th October. U.D.C. Street lighting equipment. (See this issue.)

Australia.—11th November. Sydney City Council. 60 single-pole relays for feeder protection. (E.S.B. 23125/54. Ten/10913.)*

3rd February. Electricity Trust of South Australia, Adelaide. Turbo-alternator plant for Port Augusta "B" power station. (See this issue.)

Belfast.—15th October. Installation of automatic passenger lift in Tyrone House. Ministry of Finance, Room 103, Law Courts Building, May Street.

4th November. Electrical installation in Ballysillan intermediate school. Education architect.

Birmingham.—16th October. House Building Committee. Electrical installation work in shops and houses. (See this issue.)

16th October. Welfare Committee. Installation of (a) central heating and hot water services and (b) electric lighting and power at aged persons' homes. (See this issue.)

Brazil.—25th October. Comissao Estaduol de Energia Eletrica, Porto Alegre. 82,100 insulators. (E.S.B. 23248/54. Ten/10932.)*

Cannock.—16th October. U.D.C. Street lighting scheme, Watling street. Surveyor, Council House, The Green.

Chelmsford.—25th October. Corporation. Street lighting installations. (See this issue.)

Durham.—15th October. County Council. Electrical installation in new hostel for old people at Seaton Carew. County architect, Court Lane, Durham.

India.—29th October. Director General of Supplies and Disposals, New Delhi. Diesel electric generating sets. (E.S.B. 23153/54. Ten/10937.)*

30th October. Government of Mysore Stores Purchase Committee. A.c.s.r. conductors. (E.S.B. 23643/54. Ten/10964.)* 2nd November. Switchgear. (E.S.B. 23646/54. Ten/10954.)*

Iraq.—31st October. Directorate of General Municipalities. Eight 50 kVA transformers. (E.S.B. 23622/54. Ten/10951.)*

10th November. Central Foreign Purchasing Board, Bagdad. Four channel 2 kW transmitters. (E.S.B. 23109/54. Ten/10897.)*

Irish Republic.—20th October. Donegal County Council. Electrical installation in new district hospital, Carndonagh. (E.S.B. 23102/54. Ten/10899.)*

Larne (Co. Antrim).—5th November. Electrical installation in Gardenmore Presbyterian Church. H. C. Walker, 38, Victoria Road.

Llandudno.—29th October. U.D.C. Conversion of street gas lighting to electric lighting. (See this issue.)

Longbenton.—25th October. U.D.C. Electrical conversion installations in houses. (See this issue.)

Maybole.—29th October. Town Council. Street lighting. (See this issue.)

Newcastle-on-Tyne.—23rd October. Transport and Electricity Department. L.v. lead-covered cable. F. S. Taylor, general manager.

Portuguese East Africa.—25th October. Ports, Railways and Transport Department, Lourenco Marques. Cable and accessories. (E.S.B. 22730/54. Ten/10931.)*

Portuguese Guinea.—30th October. Commercial Delegation for Overseas Territories. H.v. transmission scheme from Bissau power station. (E.S.B. 23588/54. Ten/ 10950.)*

Salford.—16th October. City Council. Pedestrian controlled electric street orderly truck with charger. Director of Public Cleansing, Bexley Chambers, Bexley Square.

South Africa.—27th October. Stores Department, South African Railways, Johannesburg. (E.S.B. 23167/54. Ten/10927.)*

Southern Rhodesia. — 15th October. Ministry of Posts, Federation of Rhodesia and Nyasaland, Causeway. Underground telephone cable. (E.S.B. 23173/54. Ten/10917.)*

Twickenham.—4th November. Borough Council. Street lighting improvements. (See this issue.)

United States.—13th October. Bonneville Power Administration, Portland, Oregon. Disconnecting switches. E.S.B. 22863/54. Ten/10891.)*

2nd November. Corps of Engineers, Portland, Oregon. Three motor control centres for Dallas Down power house. (E.S.B. 23080/54. Ten/10946.)*

Uruguay.—16th November. Administracion Generale de les Usinas Electricas y los Telefonas de Estado, Montevideo. Metering equipment. (E.S.B. 23645/54. Ten/10957.)*

Wisbech.—6th November. Isle of Ely County Council. Electrical installation in the divisional police station and court house. (See this issue.)

Wrexham.—25th October. Borough Council. Consumers' switch and fuse chambers and cabinets. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Hebburn-on-Tyne.—U.D.C. Electrical installations in 72 houses on the Monkton Lane housing estate (£2,296).—A. Robertson, Ltd.

Peterlee (Durham).—Development Corporation. Electrical installations in 310 new houses at Acre Rigg.—J. Calvert (Electrical), Ltd.

Tynemouth.—Town Council. Electrical work for eight new shops and maisonettes at North Shields (£414).—Electrical Equipment, Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnsley.—Premises at junction of Wakefield Road and Barr Lane, Staincross, for Clarksons Old Brewery, Barnsley, Ltd.; E. Cutts, Ltd., Langdale Road.

Birmingham.—Boys' technical school, Marsh Hill; Hobbiss & Hobbiss, architects, 36, Waterloo Street.

Chelmsford.—Showrooms and offices; Sewell & King, Ltd., Chelmer Garage, Springfield Road.

Research and development building; Hoffman Manufacturing Co., Ltd., New Street.

Devonshire.—Occupation centres at Plymstock and Torquay, clinics at Barnstaple, Brixham and Plymstock, and secondary modern school at Tiverton (£132,300); county architect, 97, Heavitree Road, Exeter.

Doncaster.—Junior and secondary schools; borough architect.

Harlow New Town.—Factory on industrial site; Blakedale Products, Ltd., engineers, 44, Norwood High Street, Gipsy Hill, S.E.27.

Hull.—Central hall in Waltham Street for the Methodist Mission (£62,000); Gelder and Kitchen, architects, 120, Alfred Gelder Street.

Hunts.—Police station, Fletton (£45,000-£50,000); county architect, County Offices, Huntingdon.

Isle of Ely.—High school, Ely, and college of further education, Wisbech; county architect, March, Cambs.

Liverpool.—Additional factory premises: British Trailer Co., Ltd., Kirkby Industrial Estate.

Fire stations on sites at Speke and Lowerhouse Lane; city engineer, Municipal Buildings, Dale Street, 2.

Macclesfield.—Houses, Hurdsfield estate; Macclesfield & District Building Trade Employers (75) and Kenyon Construction Co., Ltd., Ardwick, Manchester (96).

Manchester.—Warehouse and office block at Leestone Road, Wythenshawe, for J. Smylie & Son, Ltd.; W. T. Gunson & Sons, architects, 10, Marsden Street, Manchester.

Market Bosworth.—Houses (102), flats and bungalows, Desford, for R.D.C.; Council's architect, Market Bosworth, Leics.

Nuneaton.—Hosiery factory at Caldwell Road, for Francis & Wilebur, Ltd., Hill Street, Hinckley; Gotheridge & Sanders, Ltd., St. John Street, Lichfield.

Old Windsor.—Houses (80), Straight Road; New Grove Property Co., Ltd., 14, St. Andrew's House, Holborn Circus, London, E.C.1.

Paulton (Som.).—Houses (68), to be built by Purnell & Sons, Ltd.; M. R. Davies & Co., Norton House, High Street, Bath.

Pontypool.—Houses (270), Trevethin neighbourhood unit; U.D.C. surveyor.

Portsmouth.—Dwellings (810), Leigh Park; city architect.

Showrooms and offices, Henley Road; Samuel Salter & Sons, Ltd., 13, Fawcett Street, Southsea.

Sheffield.—Proposed new £1,000,000 factory; Batchelors Peas, Ltd., Wadsley Bridge.

Tool factory in Aizlewood Road (£15,000); E. M. Parkin, Ltd., tool and steel specialists, Aizlewood Road Works, 8.

Houses (274), Stradbroke Road; city architect.

Southsea (Portsmouth).—Factory in Victoria Road North; S. Schneiders & Son, Ltd., clothing manufacturers, 189, Victoria Road North.

South Wigston.—Factory; Brevitt Shoe Manufacturers, Ltd., Overstone Road, Northampton.

Torquay.—Houses (53) and 10 flats, Rockend estate; F. T. Stoneman, Ltd., builders, 49, St. Margarets Road.

Walthamstow.—Flats (36), Prospect Hill; Bow Lane Construction Co., Ltd., 102, High Road, Buckhurst Hill.

Wigan.—Factory, Kitt Green; H. J. Heinz & Co., Ltd., Harlesden, N.W.10.

[Irish Electrical Imports

A total of 9,576 vacuum cleaners valued at £102,440 was imported by the Republic of Ireland in the first half of this year, according to the official trade returns. Of the total, Britain supplied 5,407 (£29,944). Electric cookers imported totalled 5,657 (£111,816) of which Britain supplied 5,616 (£110,806). The value of other electrical apparatus, appliances and parts imported in the period was £276,476. Electro-mechanical appliances imported were valued at £84,227.

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No matter how large or small, we shall be glad to quote for Battery Chargers made to suit your own particular purpose.

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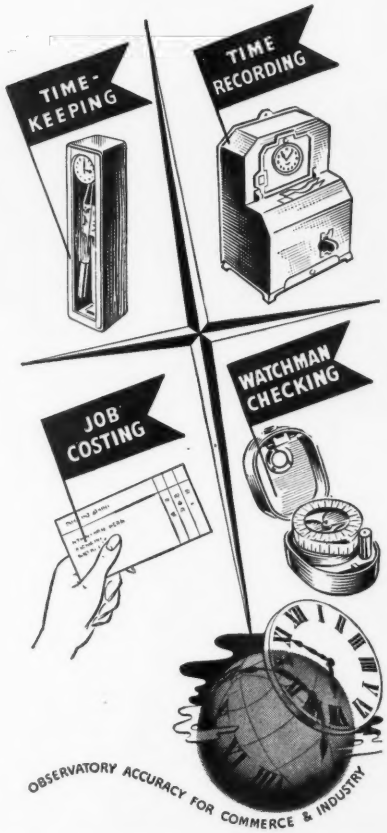
Wm. Clark (Spare Parts) Ltd., 438 Harrow Road, London, W.9.



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	4 ft	40w	1,520	**1,640**
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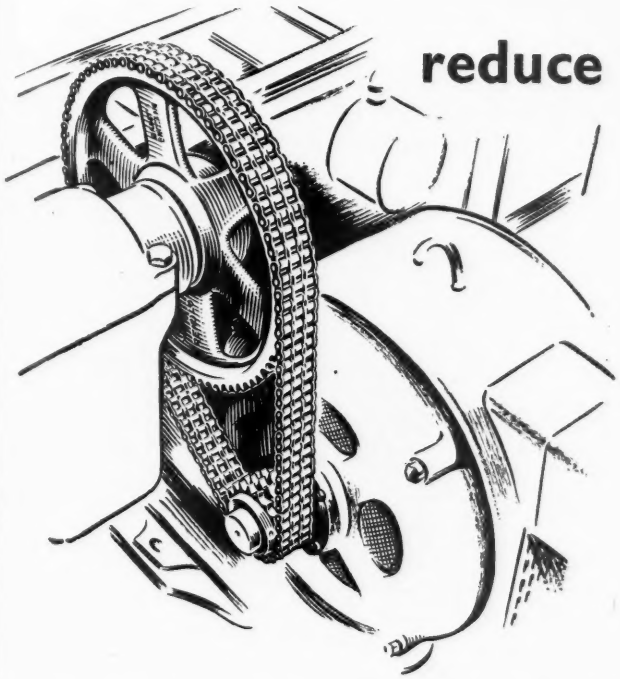

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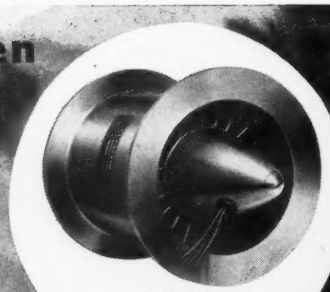

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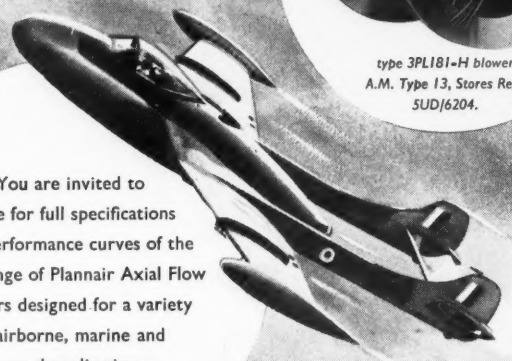

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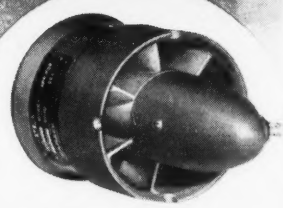

type 2PL81-H blower
A.M. Type 12A, Stores Ref: 5UD/6205.

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FOR THE WORLD'S FINEST AIRCRAFT

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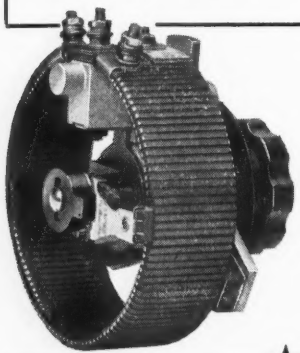
A range of extremely robust

ROTARY RHEOSTATS



Open or enclosed types
100 watts
150 watts
200 watts
Larger sizes quoted on request

An extremely robust rheostat with a unique metal cored former (patent appd. for)

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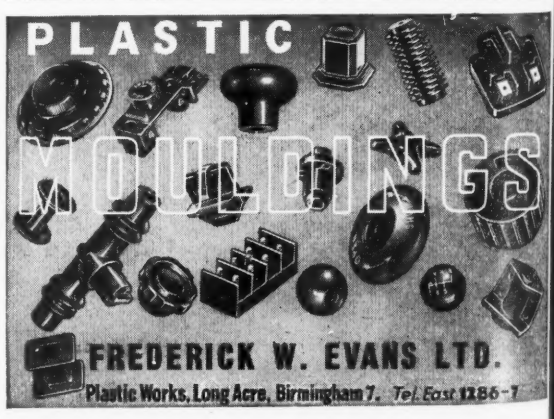

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NEW HIGH STANDARD IN STABILISED A.C. POWER SOURCES

ELECTRONICALLY CONTROLLED CONSTANT VOLTAGE SET TYPE VR/ECV

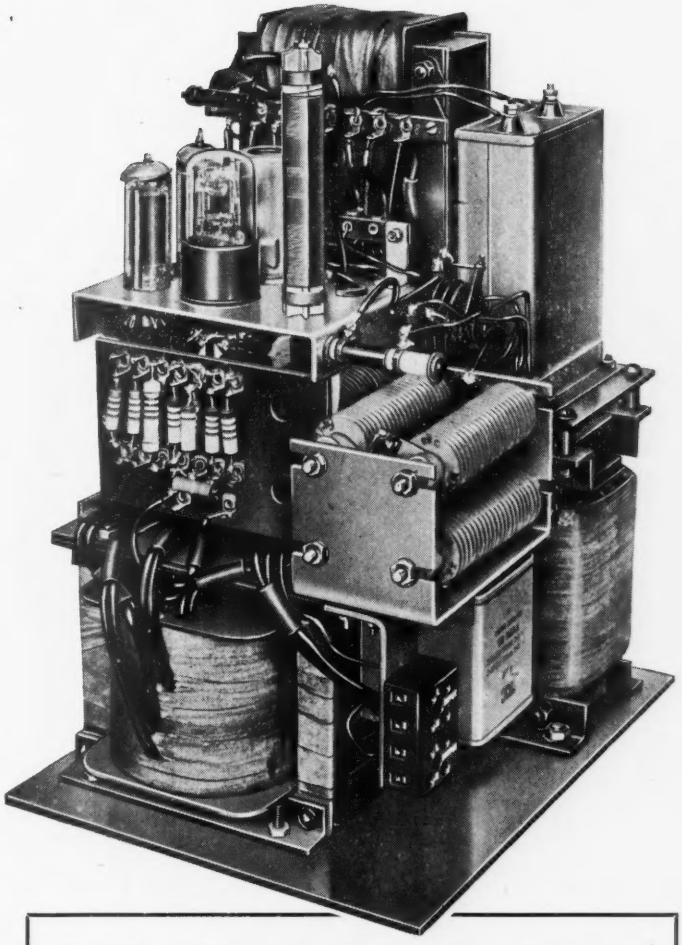
The problem of stabilising an A.C. source of supply for the varying needs of industry has up to now been only partially solved. There are several types of saturated core constant voltage transformers which satisfy some of the conditions, but these generally are frequency dependent and any additional compensating circuit for this feature renders the equipment load dependent. Also there are the electro-mechanical type regulators depending on the operation of a transformer tap-changing mechanism by an automatically controlled motor, the disadvantages of such circuits are the slow speed of response and the inconvenience of moving parts.

There are many applications in industry and communications where the disadvantages of the above circuits render them unsuitable. Such equipment as radar, photographic printing, spectrometers, electronic circuits and instruments containing illumination references call for a high degree of constancy of the mains supply under all operating conditions.

We have therefore developed a piece of static equipment capable of supplying a variable load with constant voltage irrespective of mains frequency and voltage changes. The equipment has been designed so that the output voltage has a low harmonic content, but in any case the R.M.S. value of voltage is maintained constant.

A potentiometer connected transductor circuit is employed while the control winding of the transductor is supplied from a voltage sensitive circuit incorporating a saturated diode.

A 1000 VA unit is now under development.



The following specification gives the salient features of the performance of the set

Mains frequency	**40-60 cycles/sec.**
Load	**Zero to 500 VA maximum**
Speed of response	**5 cycles**
Input Voltage	195-260 volts
Output Voltage	230 volts ±0.25%
Regulation	0.5% No load—Full load
Harmonic content of load voltage	Not greater than 8%
Physical size	10½" × 12½" × 15" high
In sheet steel case	Weight 52 lbs.

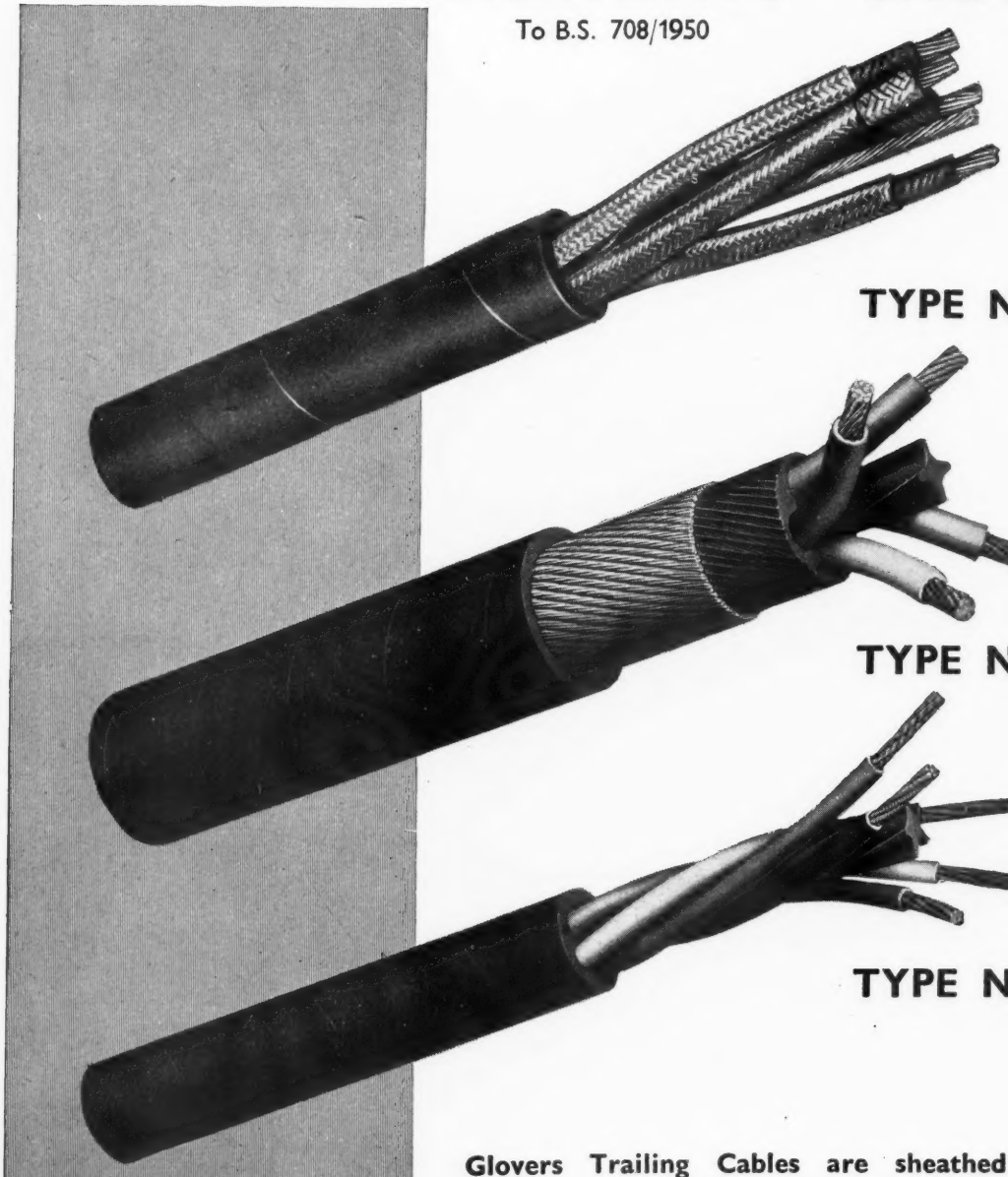
FOSTER TRANSFORMERS LTD., SOUTH WIMBLEDON, LONDON, S.W.19

A 'LANCASHIRE DYNAMO HOLDINGS' COMPANY

VR/5

GLOVERS TRAILING CABLES

To B.S. 708/1950



TYPE NO. 7

TYPE NO. 21

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Glovers Trailing Cables are sheathed with polychloroprene compound which is fire, oil and weather resisting.

W. T. GLOVER & CO. LTD.

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One [or more] of these leaflets is for YOU...

These three leaflets fully describe the wide range of standard DALY electrolytic capacitors. In general, the types listed will cover most requirements. Where specifications outside this range must be met, however, DALY will design and make special units to meet specific needs.

Behind DALY capacitors there lies 20 years of making only electrolytics, highly specialised experience which engineers throughout the world are finding invaluable, and which is readily available to you.

We shall be happy to send you copies of these leaflets without obligation.

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ELECTROLYTIC CAPACITORS

CONDENSER SPECIALISTS FOR OVER 20 YEARS

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economically produced in **one operation** *by*

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Showing the conduit connection

THE DANFOSS MOTOR CONTROL GEARS

We still stock the design with knock-outs

secure attractive looking installations, but the remarkable point being the reliable construction and the great adjustment range of each single thermal relay.

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Made to appropriate British Standard Specification conduits BSS No. 31.

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Specialised Equipment for **POWER STATIONS**

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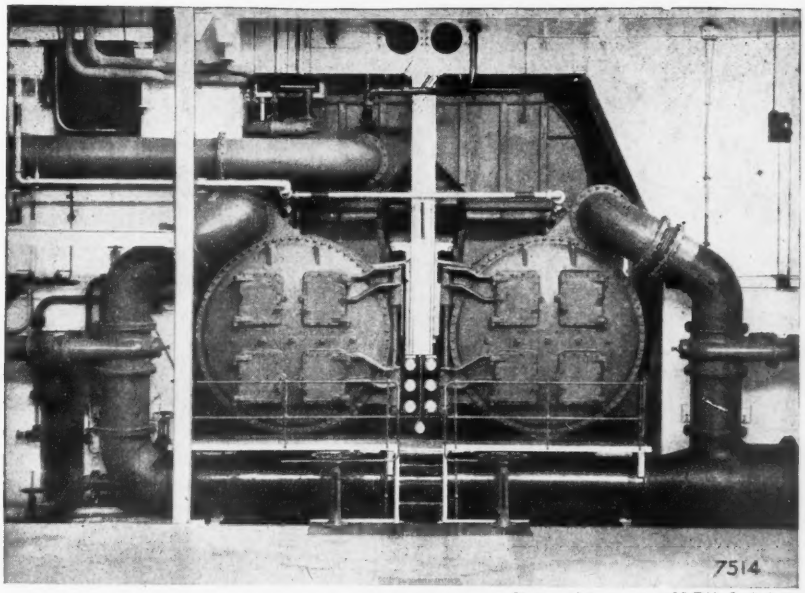

Illustrated is a MIRRLEES Surface Condensing Plant operating in conjunction with a 25,000 kW Alternator in a South African Power Station.

MIRRLEES Equipment has been supplied for the Power Plants of many Electricity Authorities and Industrial Undertakings in Britain and Overseas.

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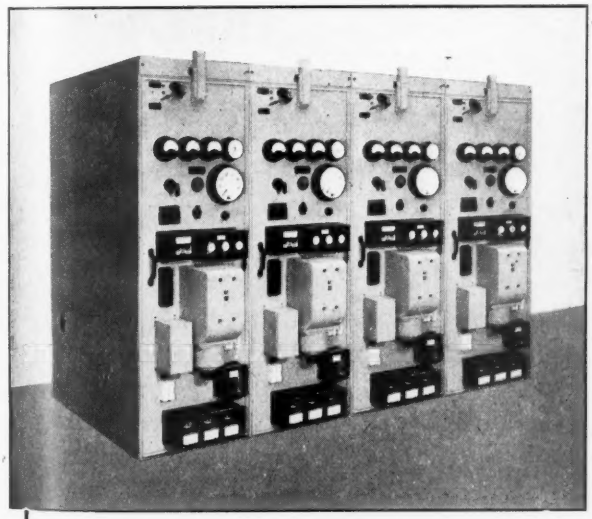
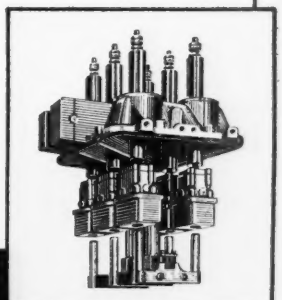


250 MVA
Switchgear
with
TYPE H. 25
oil circuit breakers
6·6 & 11kV



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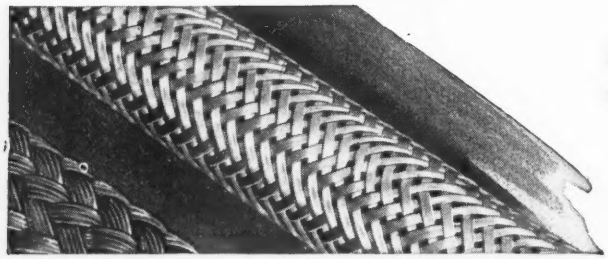

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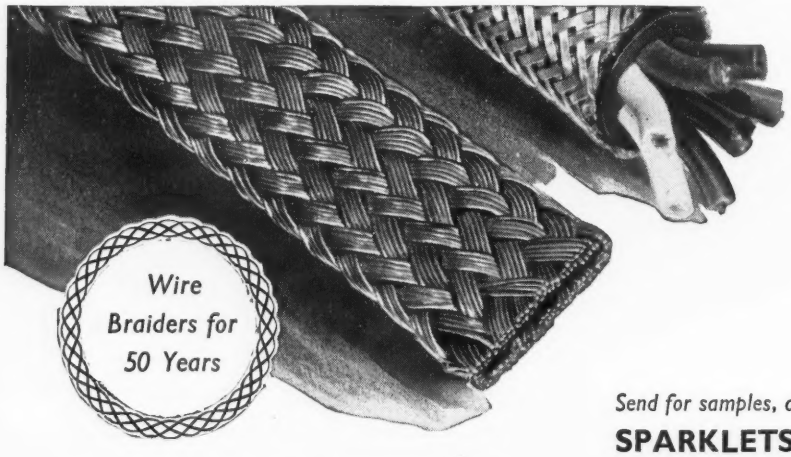

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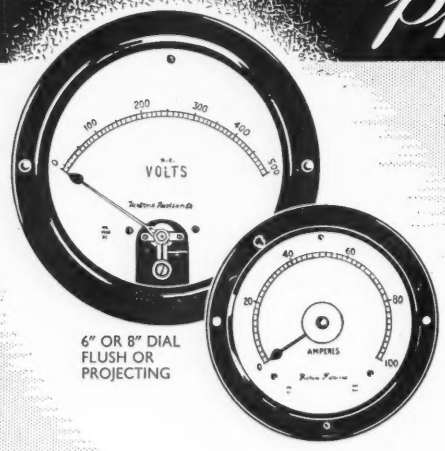

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6" OR 8" FLUSH CIRCULAR SCALE

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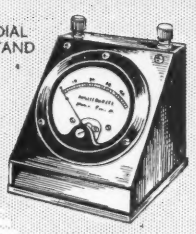

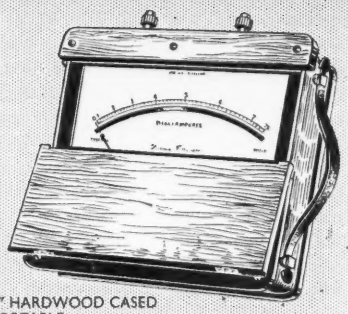

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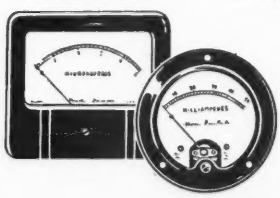

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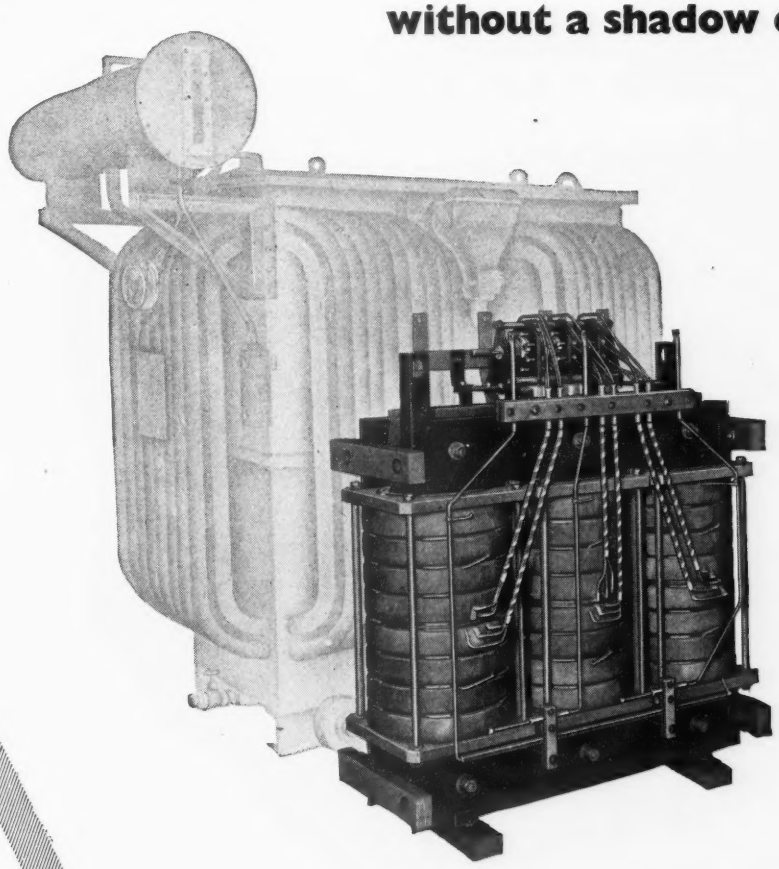

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List No. 5000

		Price
Diameter at Top	8″	**36/9d.**
Diameter at Base...	11½″	each.
Overall Height	2⅞″	
To accommodate 15 watt, or 25 watt B.C. Lamp.		Tax Paid.

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There is also a R.E.A.L. HOTEL PLINTH, List No. 5004, accommodating up to 60 watt lamps.

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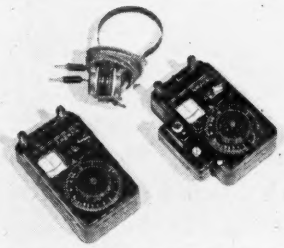

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. . . incorporates a sensitive galvanometer, slide wire, range change switch and battery in an attractive black moulded case. This instrument may also be provided with a buzzer and telephone for the measurement of fluid resistances.

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with robust construction and high accuracy

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★ d.c. measurement from 1mV to 600 volts and 5mA to 6 amperes.

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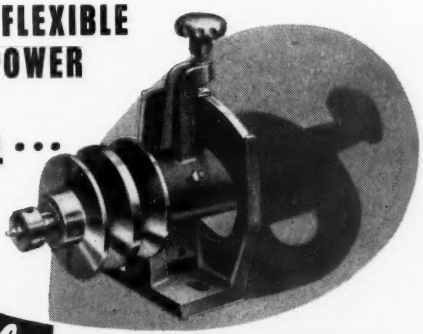

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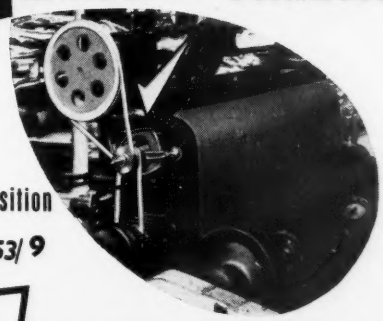

POWERS UP TO 10 H.P.
RATIOS UP TO 8 to 1
-any mounting position

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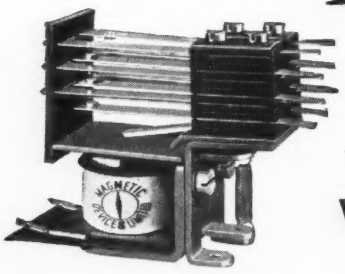
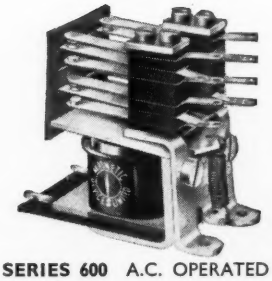


TWO GENERAL PURPOSE TYPES WITH LIGHT DUTY CONTACT RATING



SERIES 100 A.C. OPERATED
SERIES 105 D.C. OPERATED

An extremely sturdy general purpose relay, which is available in a range of contact combinations from 1 pole normally open to 4 pole changeover, and 6 pole normally open, with a maximum contact rating of 10 amps 250v A.C. Normal power consumption is 3 watts, which can be reduced for the smaller contact assemblies if required. Vacuum impregnated coils can be supplied for tropical or humid conditions.

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with such Big capacity such a wealth of features such economy in running

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A LARGER OVEN, ADDED ECONOMY IN RUNNING— & these important technical advances ✲

2960 cu. ins. oven capacity. Loading 2.1 kW.

EYE-LEVEL CONTROLS out of the children's reach, too.

EXTRA-HIGH SPLASHBACK clears the tallest domestic utensil.

TWO 8 INCH HOT PLATES and large grill boiler.

EXTRA-BIG HOT CUPBOARD takes all the plates and dishes for 5 people

NON-TILT RACKS and separate meat tin. Racks are closer wired.

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✲ Identical sheathed tubular elements at side and bottom of oven pack flat, simplify stocking of spares.

✲ One piece steel body increases earthing efficiency.

✲ Oven interior removable in 3 pieces for easy cleaning and maintenance.

✲ Special construction of oven door minimises condensation.

✲ Quick heating-up, only 16 mins. to 350° F.

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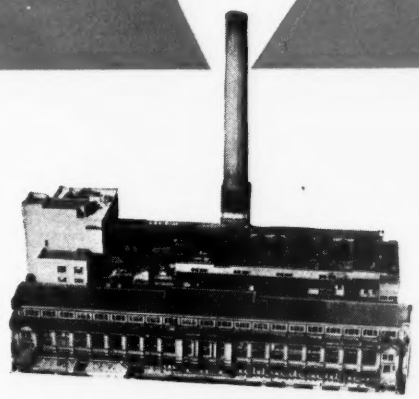

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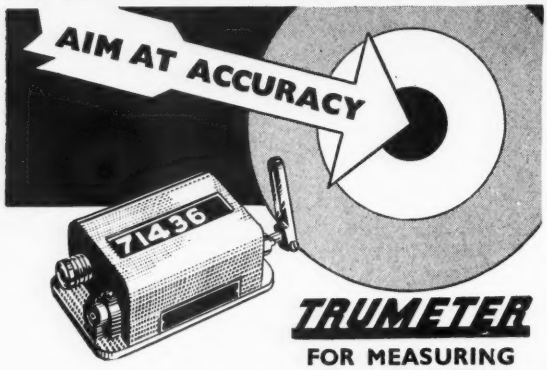

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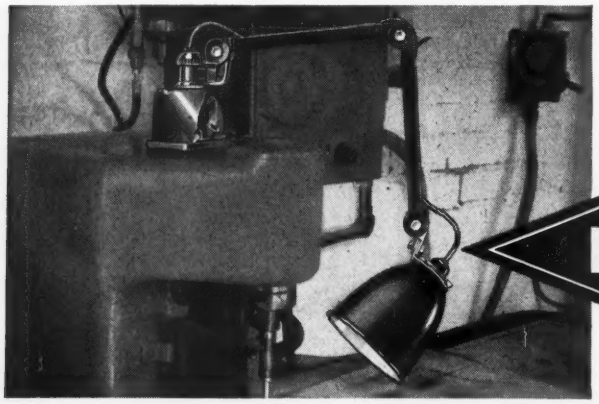

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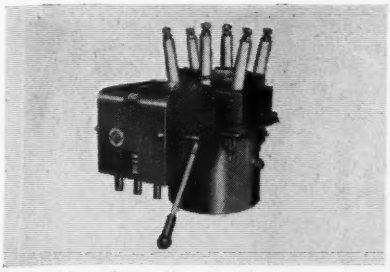
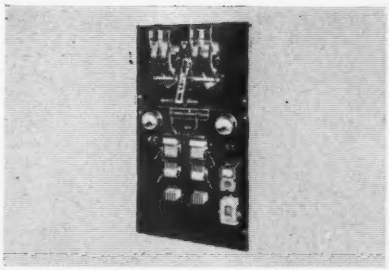
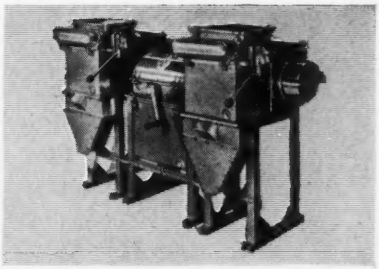


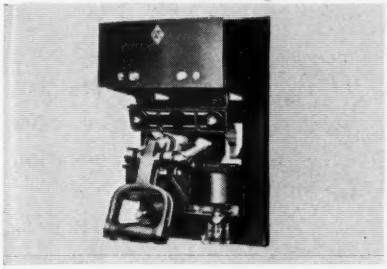
15 kV Oil Circuit Breaker for cubicle mounting



Heavy Current D.C. Circuit Breaker and Knife Switch Panel



H.V. Ring Main Switchboard with Fuse Switch controlling Tee-Off



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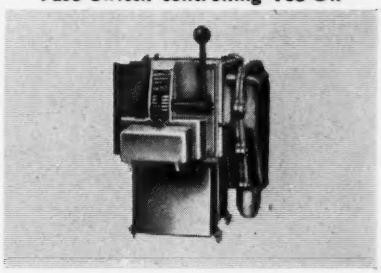
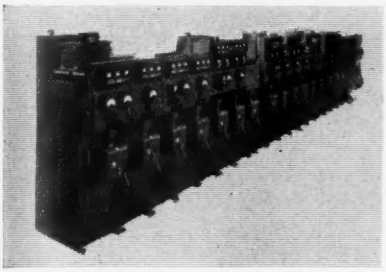
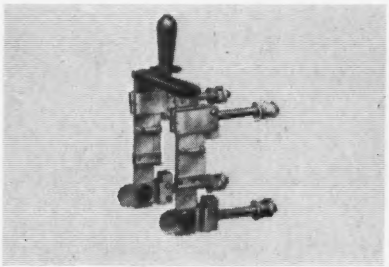


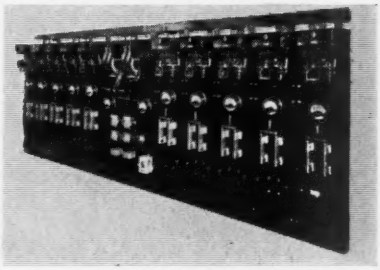
L.V. Industrial Oil Circuit Breaker



11 kV Metalclad Switchboard



Panel Mounting Knife Switch



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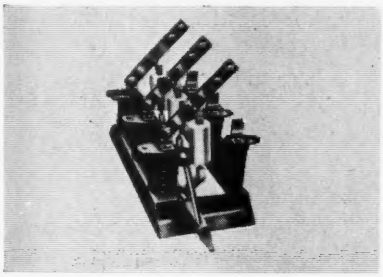
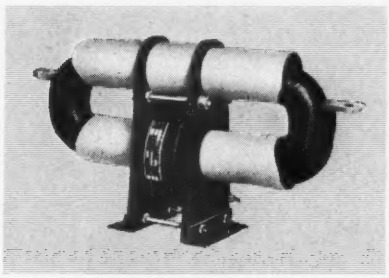
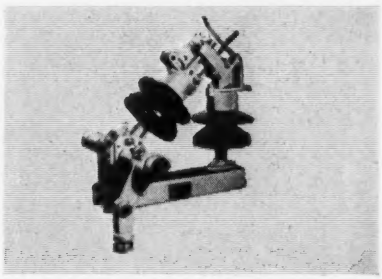


T.P. 11 kV Isolating Switch



Current Transformers



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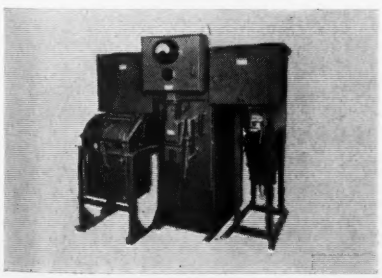

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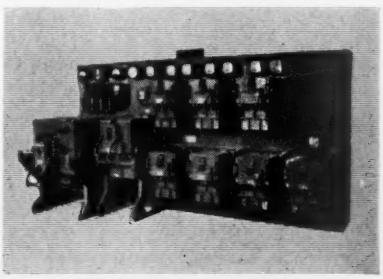

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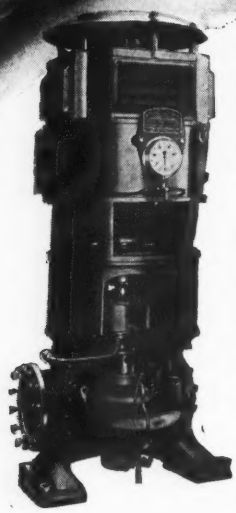

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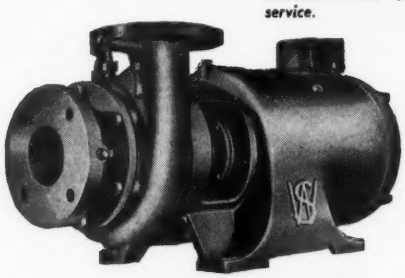

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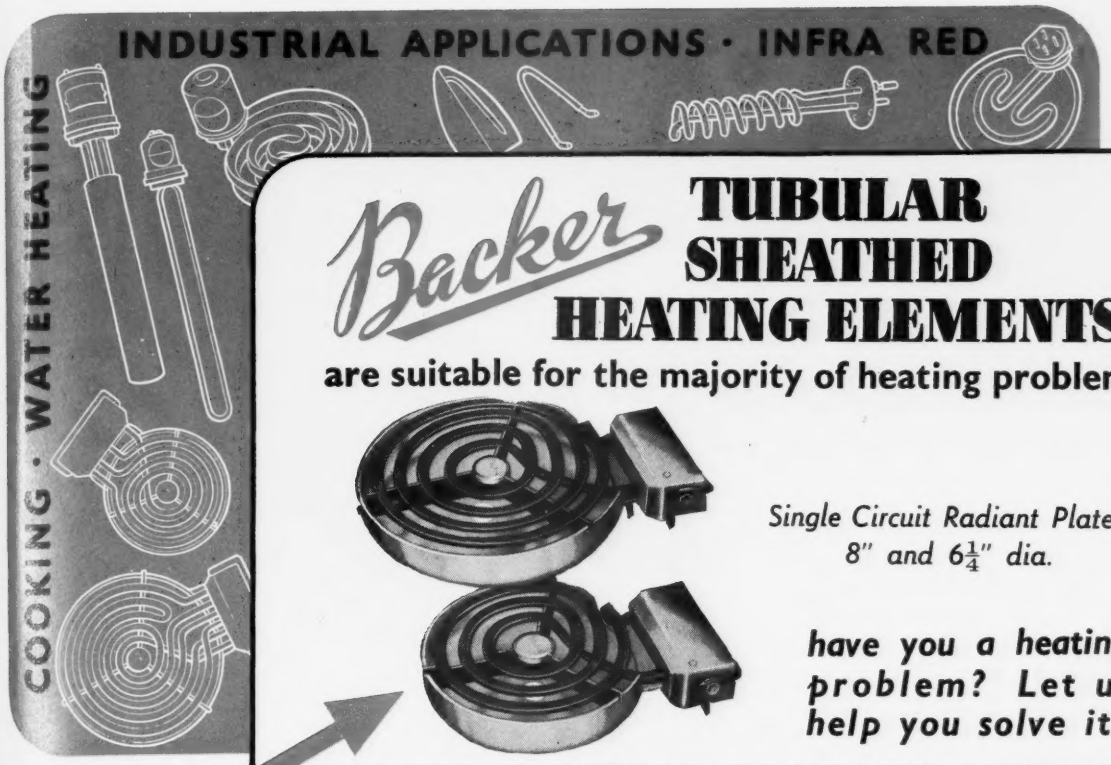

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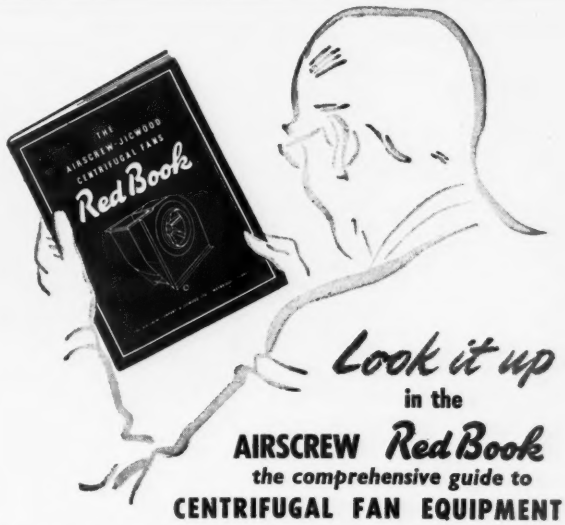

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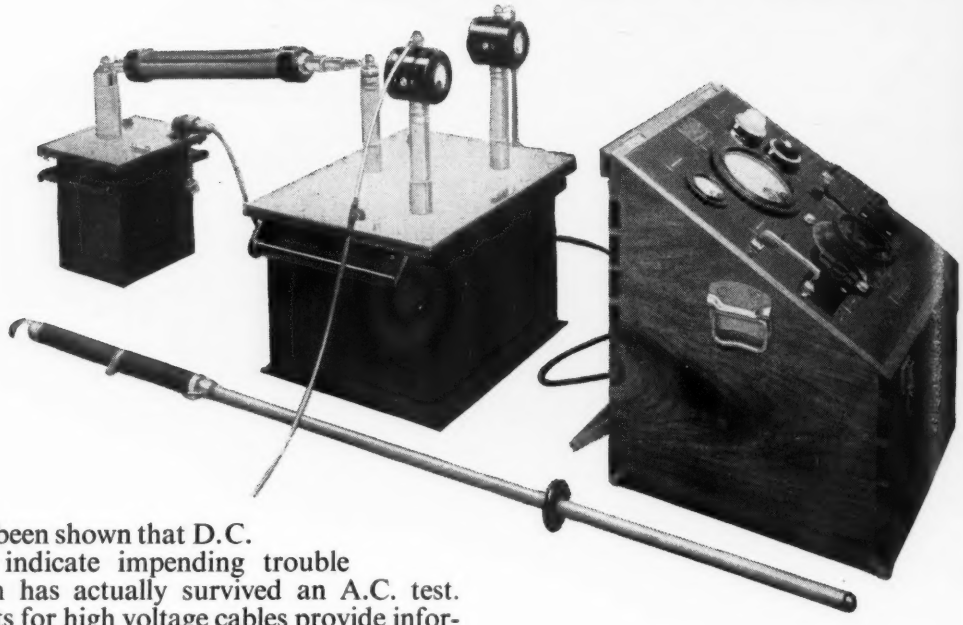

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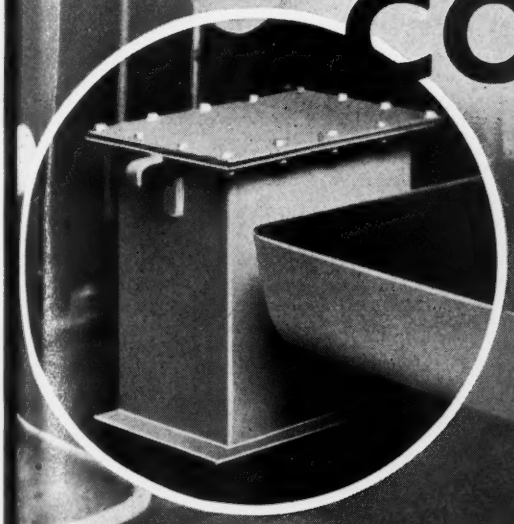

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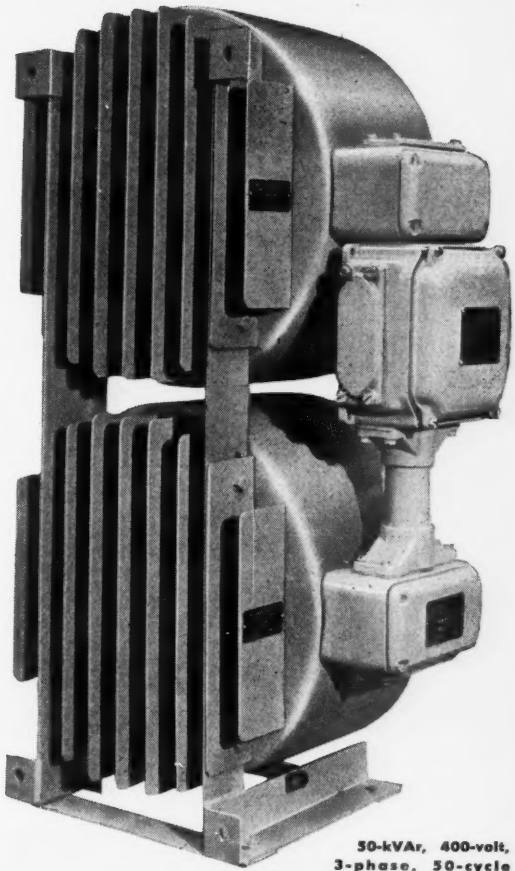

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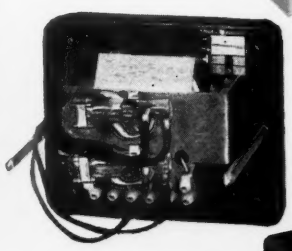

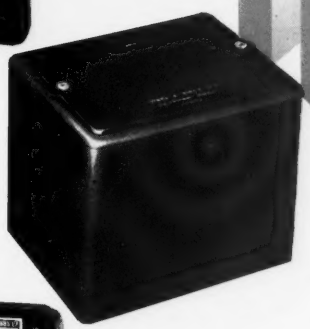

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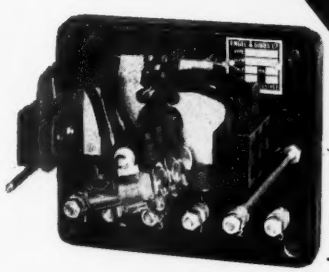

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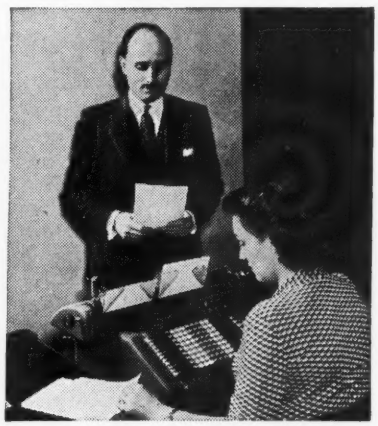
One more result has been that Associated Newspapers Ltd. are now using Burroughs Sensimatics on sales accounts for their latest paper, the "Daily Sketch."



210 postings in 45 minutes—that's a normal *rate of work achieved by Mrs. J. Dickens, seen preparing statements for newsagents in the offices of Associated Newspapers Ltd. Watching her use one of the Burroughs Sensimatic Accounting Machines is Mr. Paul Stark, the Burroughs man who helped solve "The Case of the Sunday Dispatch."*

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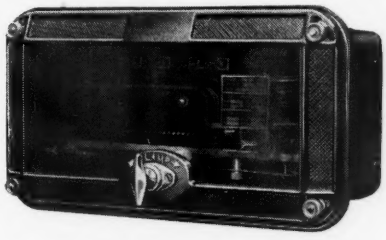

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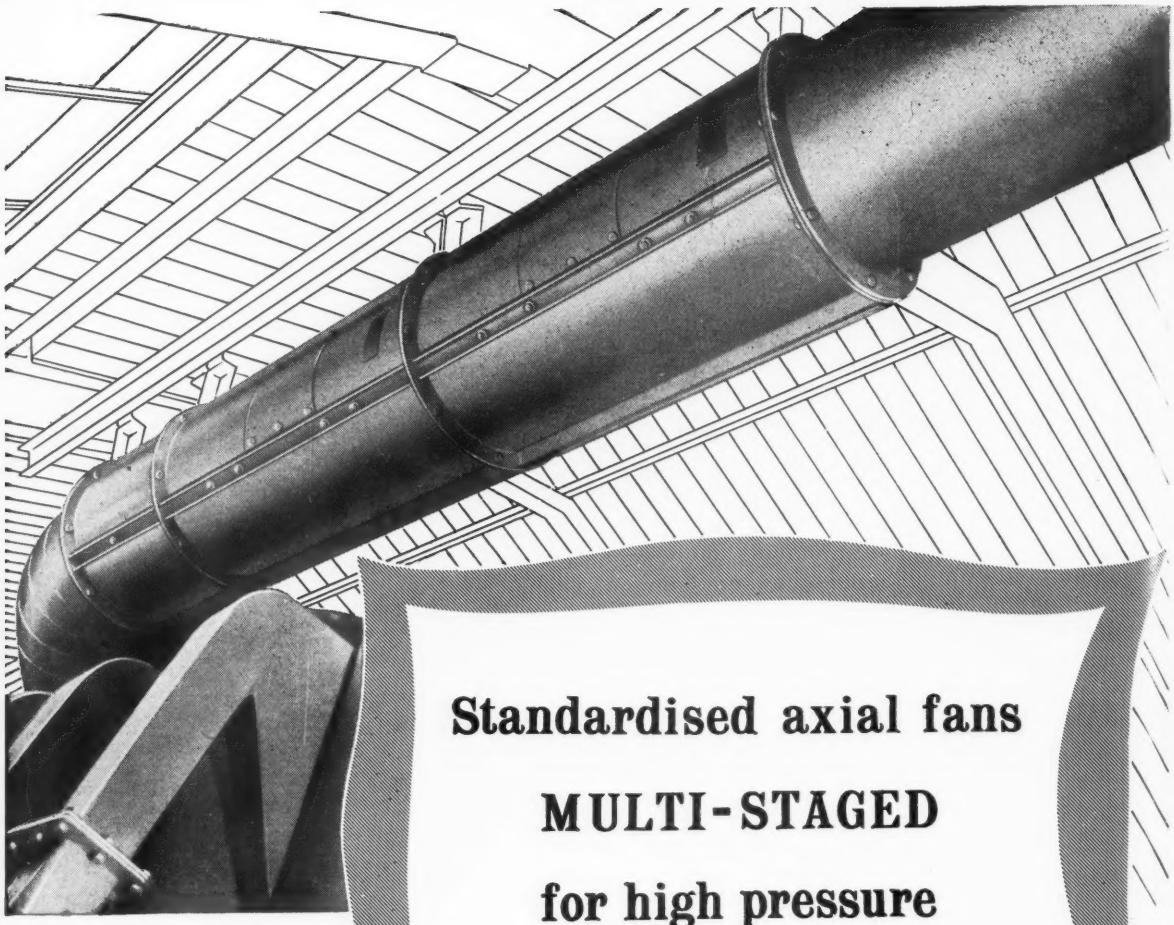

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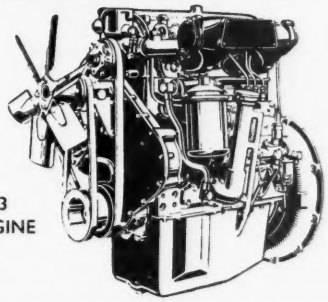
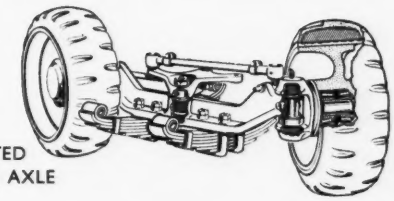
STACATRUC – a capital investment

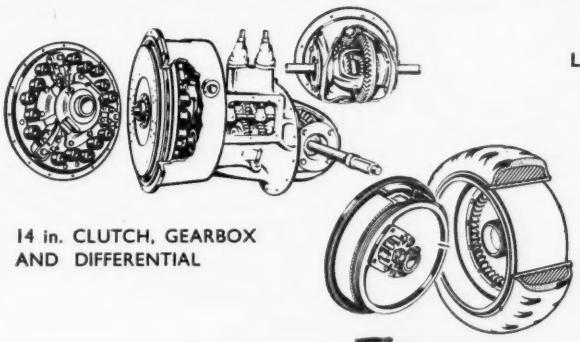


PERKINS P.3
DIESEL ENGINE



COMPENSATED
REAR STEER AXLE

MANŒUVRABILITY IS THE KEYNOTE



14 in. CLUTCH, GEARBOX
AND DIFFERENTIAL

LOCKHEED HYDRAULICS
COUPLED WITH
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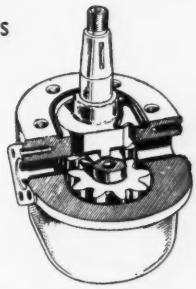

STACATRUC 40 DH.
Max. lift height 14 ft.
Max. load 5,000 lb.

SMOOTH HANDLING and ease of manœuvrability in confined spaces are the outstanding features of the 40 DH Diesel-powered Stacatruc, one of the smaller models in the range. And don't let us forget its economical running — 2s. 6d. a day! Ruggedly constructed, here is a fork-lift truck designed to work and work, whatever the conditions. May we ask our local Sales Engineer to tell you more about the versatile range of Stacatruc equipment with load capacities up to 7,000 lb. and a maximum lifting height of 14 ft.?

STACATRUC

Sold and serviced throughout the World by:— I.T.D. LTD., 95-99 LADBROKE GROVE, LONDON, W.11. Phone: PARk 8070 (7 lines)

In association with Austin Crompton Parkinson Electric Vehicles Ltd

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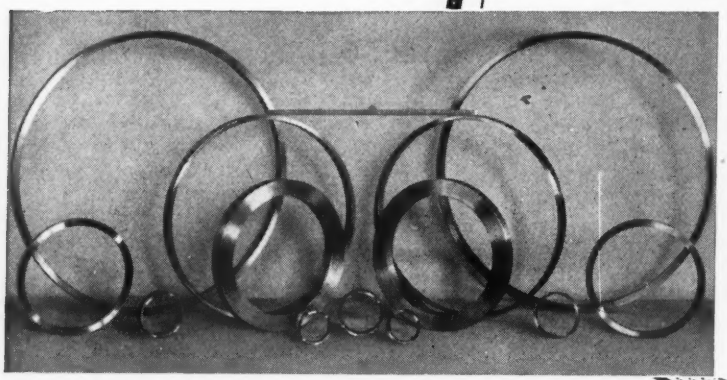
ROTOR AND STATOR END-RINGS



Are made in certain alloys having electrical properties which make them suitable for special purposes, and are supplied in High Conductivity or Arsenical Copper, either cold rolled or hot rolled. From a few inches to 7′ diameter and from a few ounces to 1½ tons in weight.

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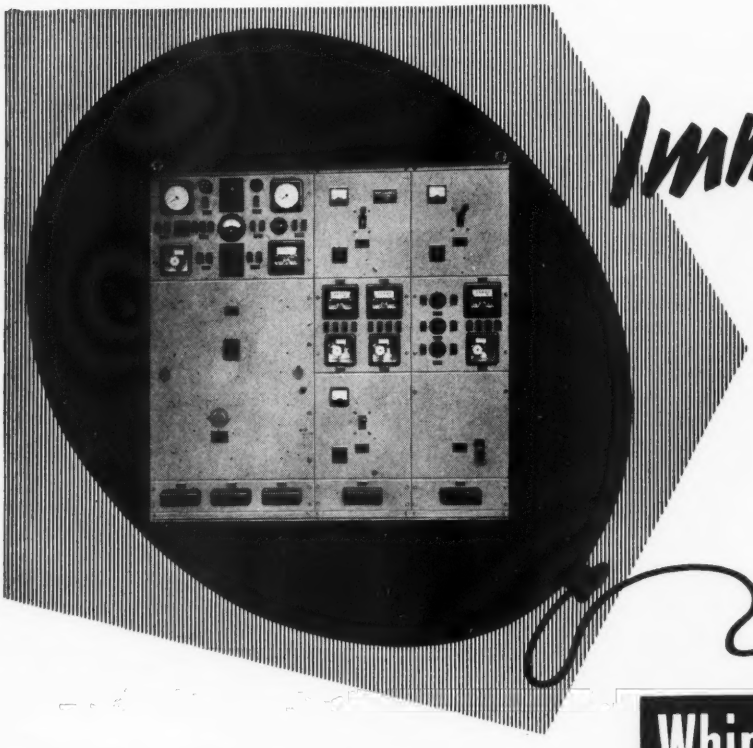
Telephone: Regent 6427/8/9. Telegrams: "Wiredrawn, Piccy, London".

WORKS:
LANCASHIRE: Mersey Copper Works, Widnes.
Sutton Rolling Mills, St. Helens.
STAFFORDSHIRE: Froghall, and Oakamoor, Nr. Stoke-on-Trent.

CVS—206



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Tested to B.S.S. 116 & 936

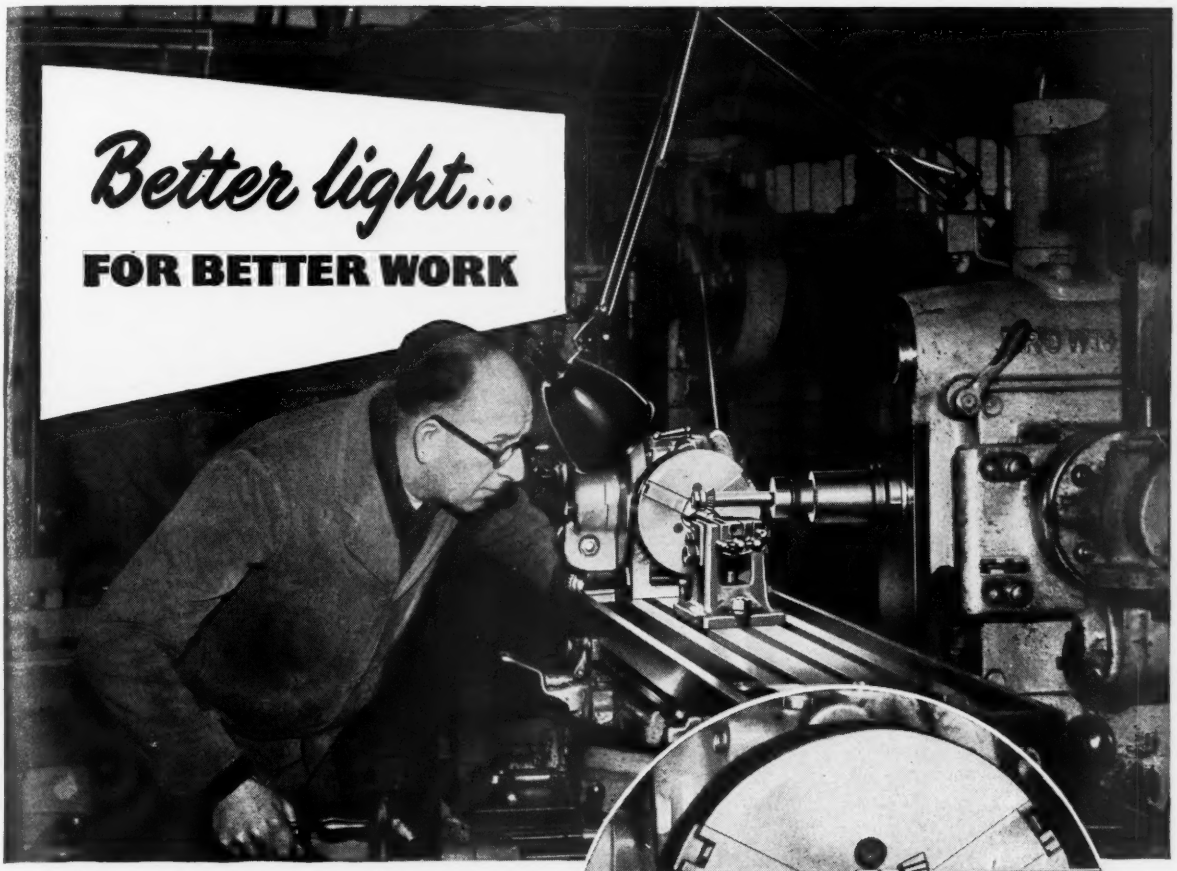
25 MVA at 400 Volts.

SWITCHGEAR SPECIALISTS: CASTLETON ROCHDALE LANCS

Whipp & Bourne Ltd.

W.21

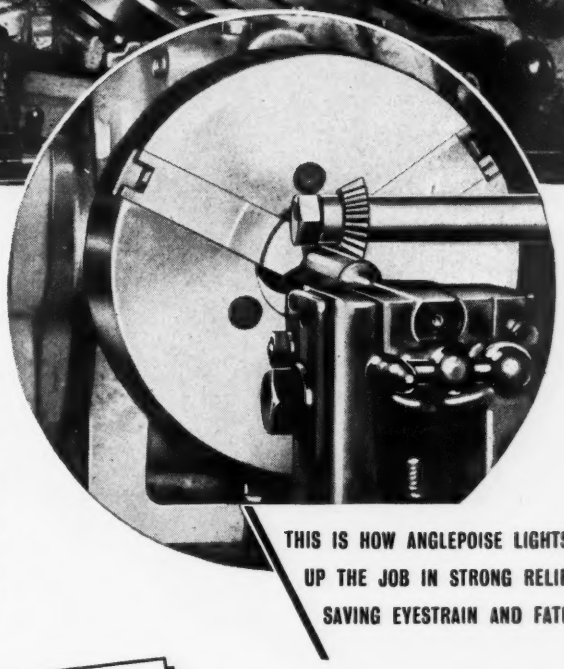
Better light...
FOR BETTER WORK



Down a little!

Still nearer!

Right on the job!



THIS IS HOW ANGLEPOISE LIGHTS UP THE JOB IN STRONG RELIEF— SAVING EYESTRAIN AND FATIGUE

However skilled a worker may be, he must 'see' the job. This applies especially in lathework, valve-grinding, on milling machines or power drills, etc., wherever adjustable close-to-the-job lighting is a sheer necessity.

ANGLEPOISE throws a clear shadowless light right on the work, not in the user's eyes and follows the job from any angle at a finger touch, degree by degree. It 'stays put' in any required position in the presence of heavily vibrating machinery and needs only a low power bulb for high class results. If you would like to know more about these fine lamps write for Booklet ER.

Sole Makers: **HERBERT TERRY & SONS LTD**
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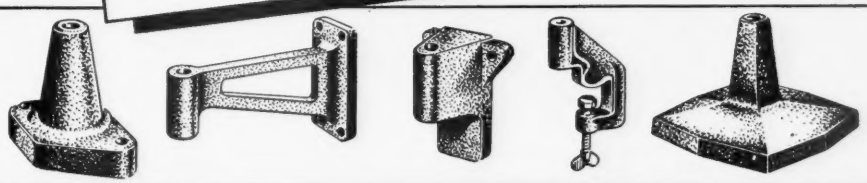
TERRY ANGLEPOISE LAMPS

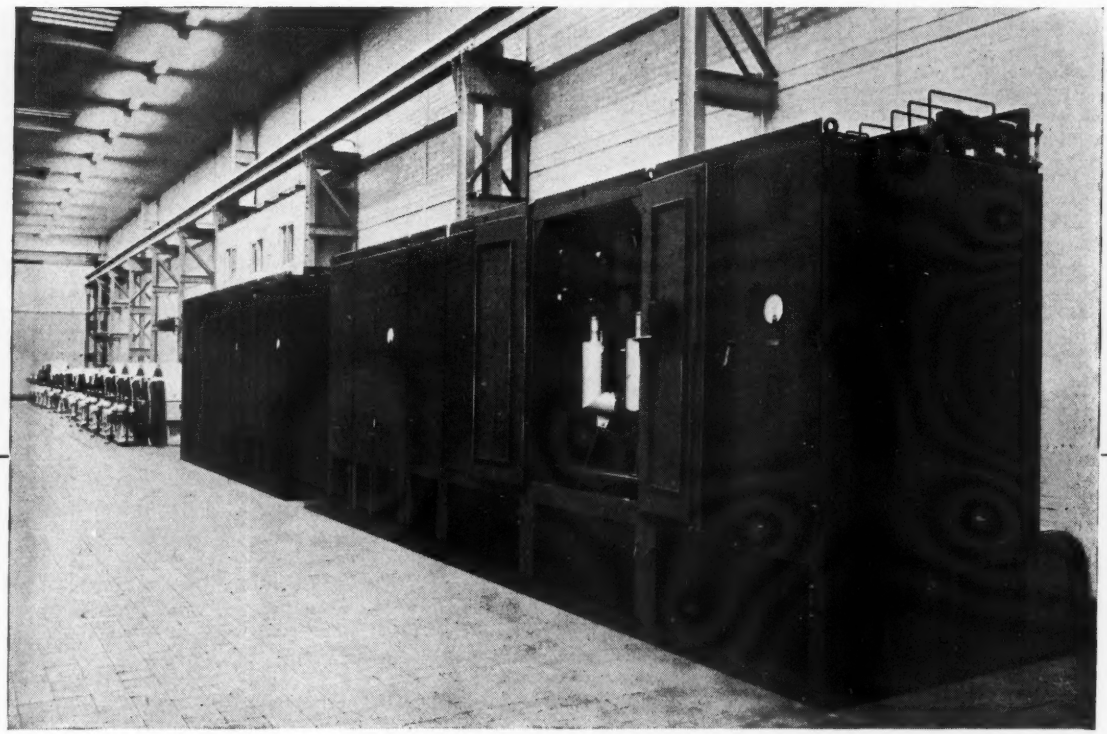
Pat. all countries

SOME ALTERNATIVE BASES FOR ALL MODELS



HTII

Rectifiers for Steel Works



Photograph by courtesy of the Lancashire Steel Corporation, Warrington

Two 1,500 kW 600 V sealed steel-tank rectifiers feed a new rod mill; the first rectifier application of this kind in Great Britain.

'ENGLISH ELECTRIC'

mercury-arc rectifiers

See also our Fusegear advertisement in this issue

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Rectifier Substation Department, Stafford

RMA.12D4

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

MOTOR STARTERS

Type CO8:F

D-O-L PUSH BUTTON OPERATED WITH BUILT-IN ISOLATOR AND FUSES

These air break or oil immersed starters are supplied for motors up to 7½ H.P.

Rewirable or H.R.C. cartridge pattern fuses.

For prices and details write for List 7-5

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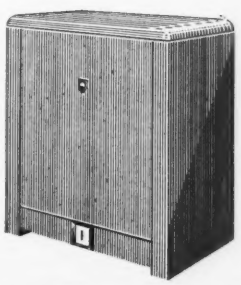

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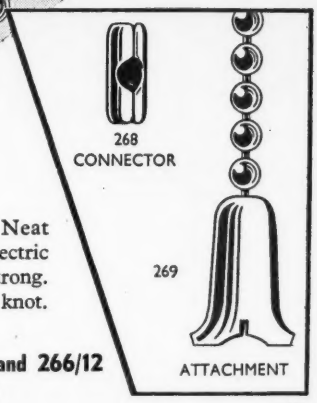
BALL CHAIN



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BEACON BALL CHAIN. Neat and Elegant for Electric Switches. Immensely strong. Will not twist, kink or knot. Made in three sizes.

Additional sizes 266/2, 266/10 and 266/12
also available from stock

SD38A

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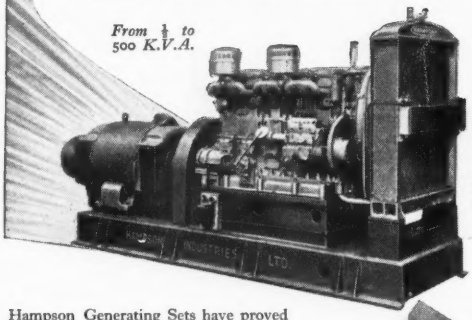
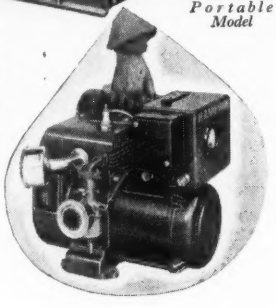
HAMPSON
SELF-CONTAINED GENERATING SETS

From ½ to 500 K.V.A.



Illustrated below is the Portable Model



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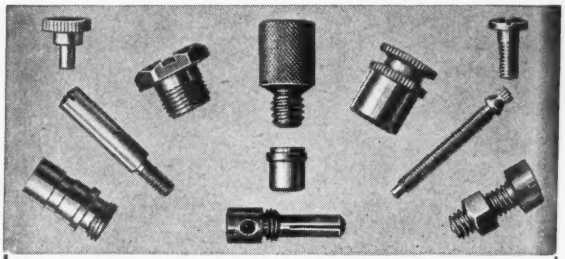

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This photograph, taken during the recent Northern Command Tattoo in Roundhay Park, Leeds, is a reminder of the important role played by electricity in such spectacular productions.

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The tattoo illumination scheme was carried out by Messrs. W. J. Furse & Co. Ltd., of Nottingham, with—

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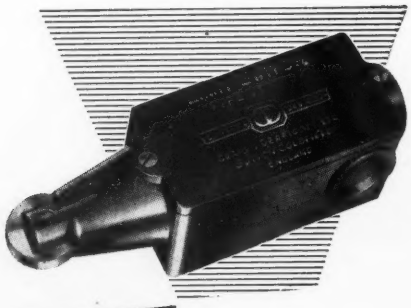

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STEM TYPE THERMOSTAT for control of IMMERSION HEATERS, PLATENS, DRYING OVENS, Etc.
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Full details and information will be supplied on request.

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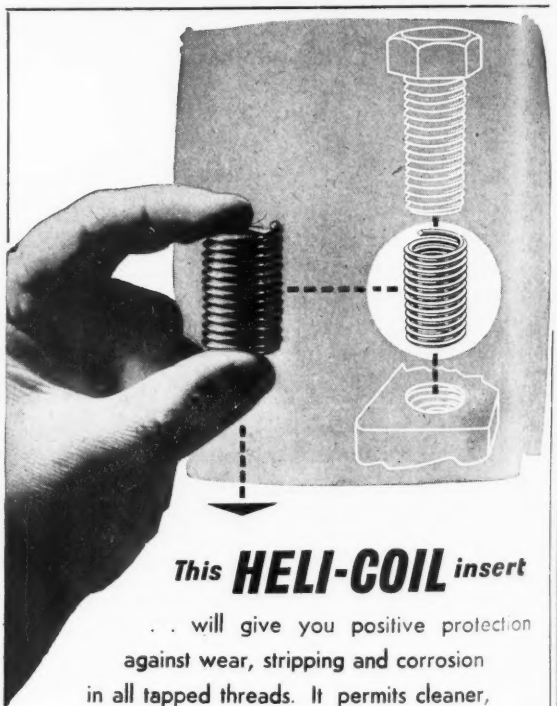

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. . will give you positive protection against wear, stripping and corrosion in all tapped threads. It permits cleaner, more functional design . . .

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Paper Insulated Cables, all types up to and including 22,000 volts

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Tough rubber Sheathed Trailing Cables

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All types Mining Cables

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H.S.O.S. and P.B.J. having copper, aluminium alloy or all aluminium conductors

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V.I.R. Taped, braided and compounded to BSS 7/1953

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We entirely agree with the little fellow: better a free squirrel than a caged lion. *Vive la liberté!* We believe it's a good philosophy in business too.

Britannic Cables

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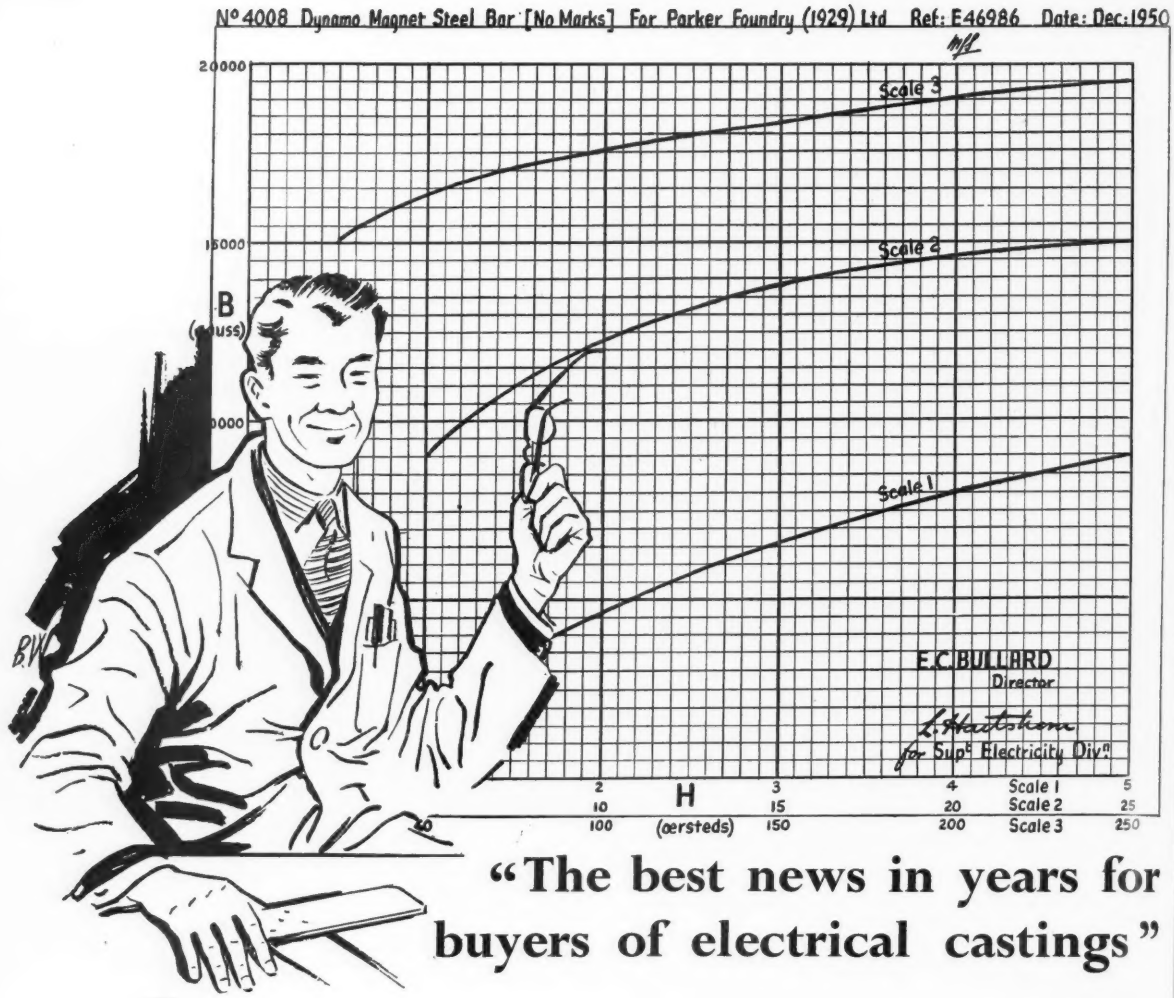
is and always has been an *independent* company. A world-wide and still growing body of customers are finding our freedom very much to their advantage.

Britannic Cables carry the load

BRITANNIC ELECTRIC CABLE & CONSTRUCTION COMPANY LTD., IVER, BUCKS.



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NATIONAL PHYSICAL LABORATORY

REPORT
ON TESTS OF
DYNAMO MAGNET STEEL BAR No. 4008
(NO MARKS)

TESTED FOR:- MESSRS. PARKER FOUNDRY (1929) LTD.,
"TROPENAU" STEEL WORKS,
DERBY.

The material was brought into successive steady cyclic states of H and B from the corresponding values the following Table and accompanying curve were obtained.

TABLE

H oersteds	B gauss	μ
0.2	100	500
0.3	180	600
0.5	400	800
0.7	750	1 100
1.0	1 600	1 600
1.5	3 250	2 170
2.0	4 600	2 300
3.0	6 560	2 190
5.0	9 000	1 800
7.0	10 640	1 520
10	12 250	1 225
15	13 780	919
20	14 580	729
30	15 420	514
50	16 320	326
70	16 900	241
100	17 540	175.5
150	18 360	122.5
200	19 000	95.0
250	19 550	78.2

E. C. BULLARD
Director.

Date 12th December, 1950.
Reference E.469.86.
Passed by
for Superintendent, Electricity Division.

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CONNECTORS

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No. 712 5 amp. No. 812 10 amp. No. 912 15 amp.

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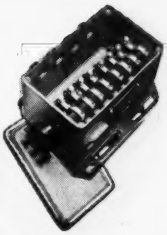
Compact and reliable chain and hand operated limit switches are designed for all industrial purposes.



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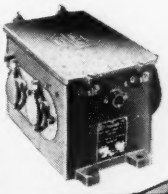
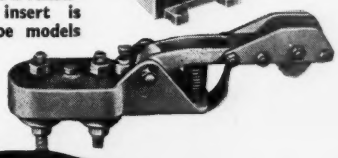
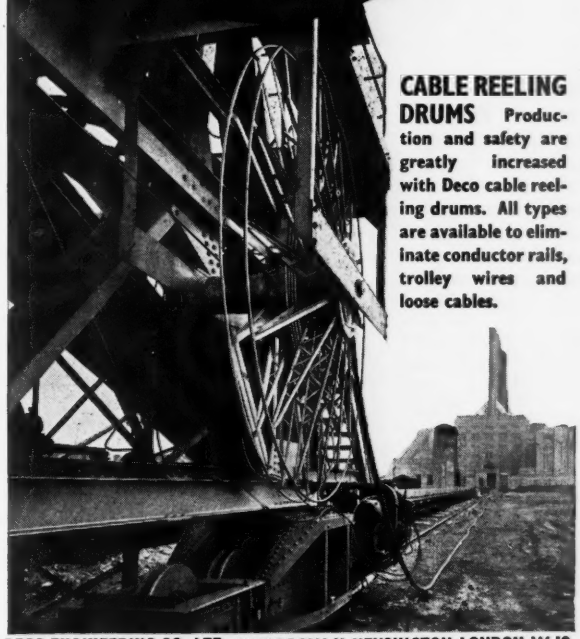
Specially developed for conveying plants, hoists and similar equipment, also for automatic safety devices.



SLIPPER COLLECTORS
A single shoe model with a renewable 3 face carbon insert is illustrated. Double shoe models are also available.



DECO
electrical products for industry



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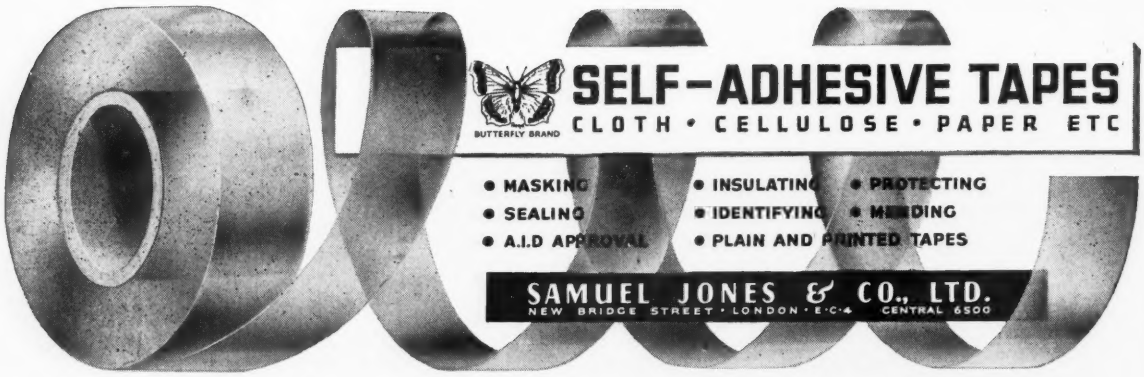
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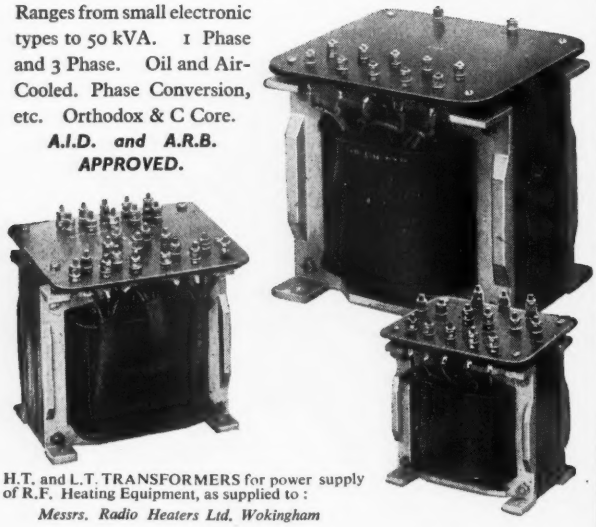

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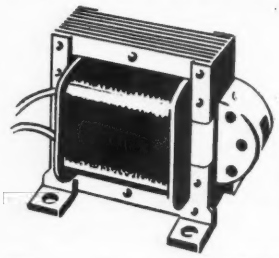

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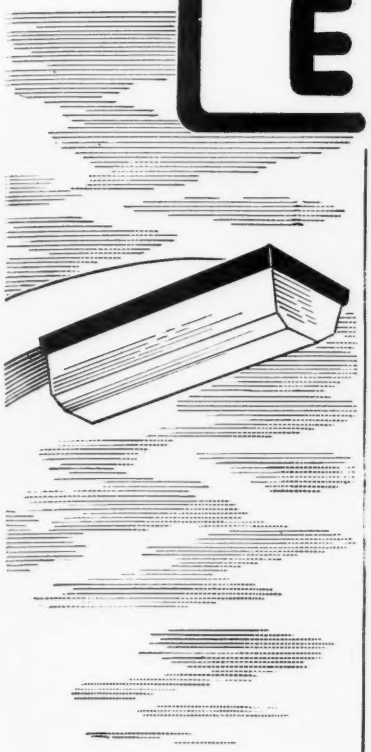

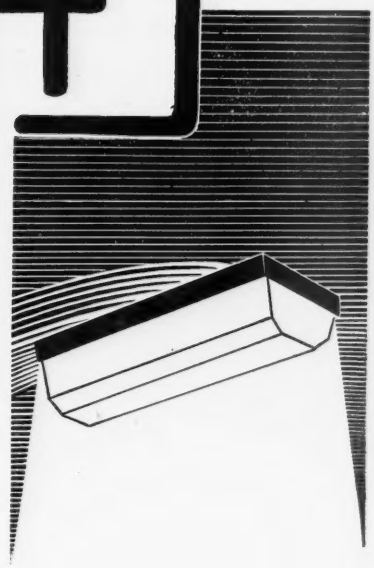

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No moving parts
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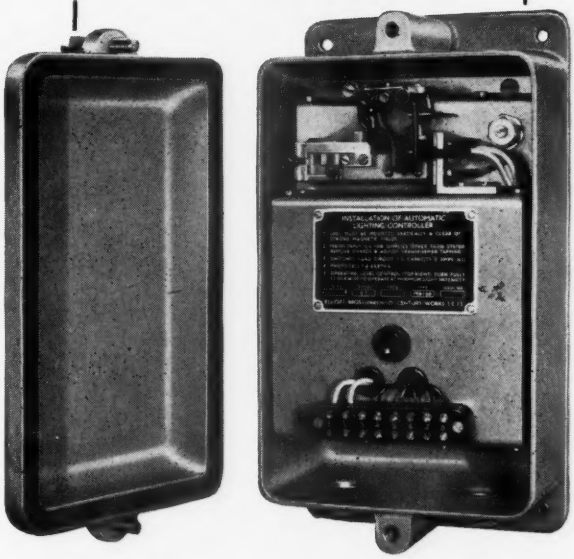
No resetting

- Elliott magnetic amplifier eliminates thermionic valves.
- Exceptionally long life with minimum maintenance.
- Positive operation at specific light levels.
- Photo-electric control eliminates resetting.



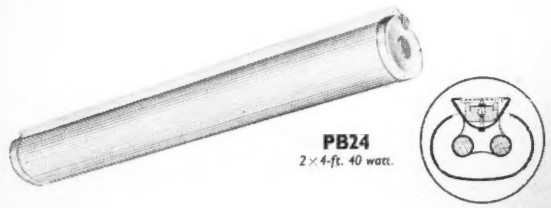
Switches lighting circuits automatically on and off according to daylight intensity. Robust, reliable and easily installed on most existing circuits.

The most advanced Automatic Lighting Control System for Highways, Islands and Crossings, Factories, Airports, Harbours, Docks and Marshalling Yards.

WRITE FOR PUBLICATION M.A.2 TO ELLIOTTRONICS DIVISION

ELLIOTT BROTHERS (LONDON) LTD., CENTURY WORKS, LEWISHAM, S.E.13. Phone: TIDEWAY 3232

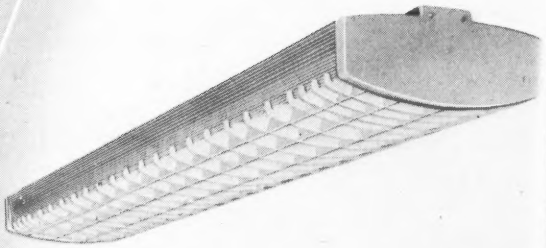
Adaptations of the **Maxilite** range with glass and perspex diffusers.

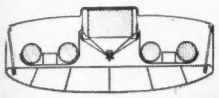


PB24
2×4-ft. 40 watt.

GB14
1×4-ft. 40 watt.

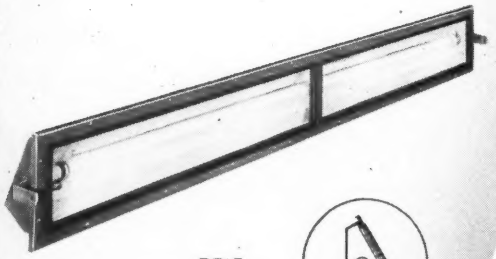
A range of attractive fittings using luminated glass side screens and bottom louvre to effectively diffuse the light from the lamps. Available for two or four 4-ft. or 5-ft. lamps.





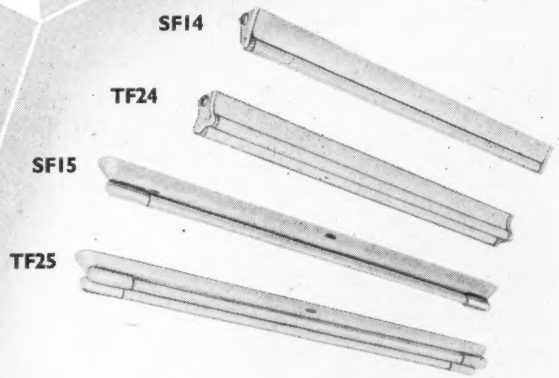
LF45
4×5-ft. 80 watt.

SB Hi-Craft
FLUORESCENT LIGHTING



PF15
1×5-ft. 80 watt.

A fitting designed for use in garage inspection pit to illuminate the underside of a vehicle.



MAXILITE
BATTEN FITTINGS

for single and twin lamps in 2-ft., 3-ft., 4-ft. and 5-ft. sizes.

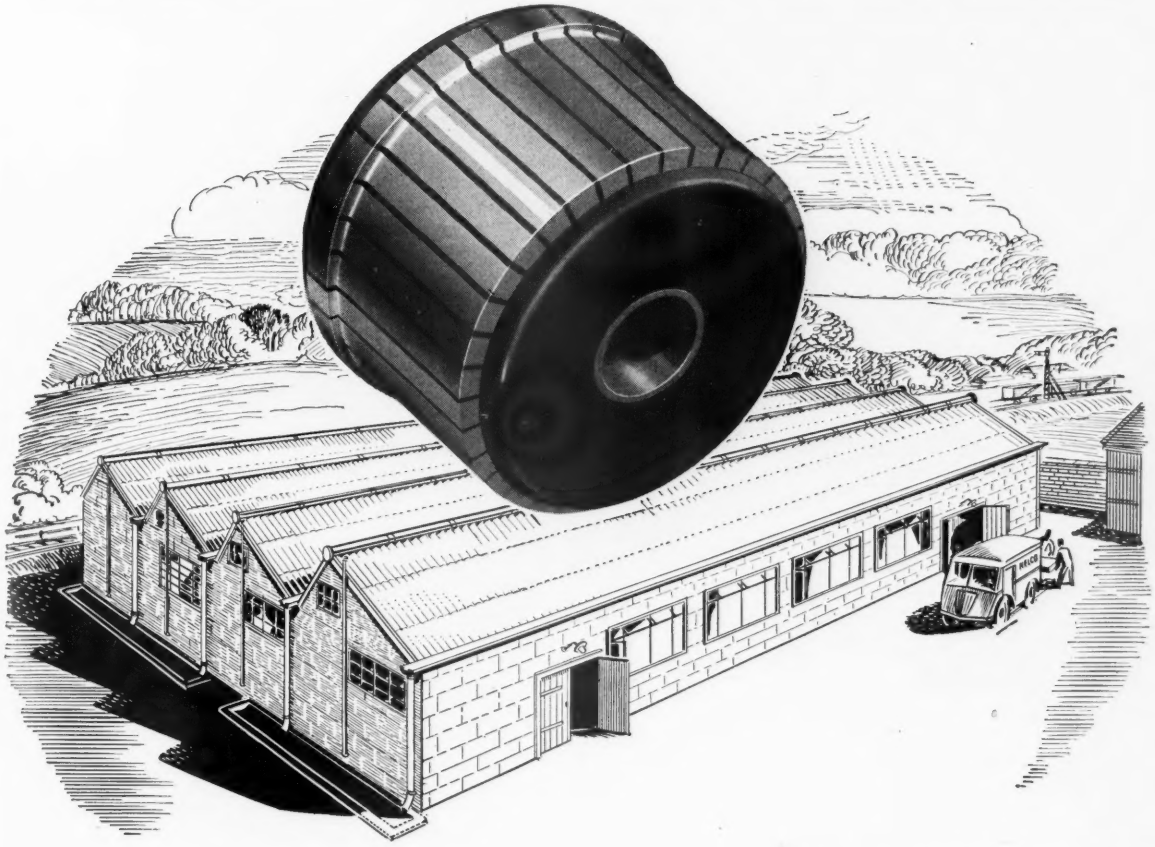
4FG4

SB Hi-Craft FLUORESCENT LIGHTING

Manufactured by SMART & BROWN (ENGINEERS) LIMITED

HEAD SALES OFFICE: 8, ROSE & CROWN YARD, KING STREET, ST. JAMES'S, S.W.1. Tel.: WHITEHALL 8267
BRANCHES: Manchester · Leeds · Birmingham · Bristol
ELECTRICAL WORKS: Trading Estate, Spennymoor, Co. Durham. Tel.: Spennymoor 2273.

Moulded COMMUTATORS



Above is pictured a recent extension to the NELCO works enabling production to be increased to meet the demand for NELCO MOULDED COMMUTATORS of all types with mica or micanite inter-segment insulation, and of NELCO MOULDED SLIP-RINGS.

NELCO MOULDED COMMUTATORS can be supplied as single, super-imposed (Br. Patent No. 590747) or super-imposed and slip-ring units. All are tested and inspected to rigid limits.

Your enquiries are welcomed for "standards" or "specials".

NELCO
LIMITED

A.I.D. and A.R.B. Approved

SHALFORD, NR. GUILDFORD, SURREY

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MICA

Processed Parts
Precision Gauged
for
CONDENSERS, ETC.

Bakelite
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Sheet & Machined Parts
of all kinds.

DACIER, LTD.,
22,
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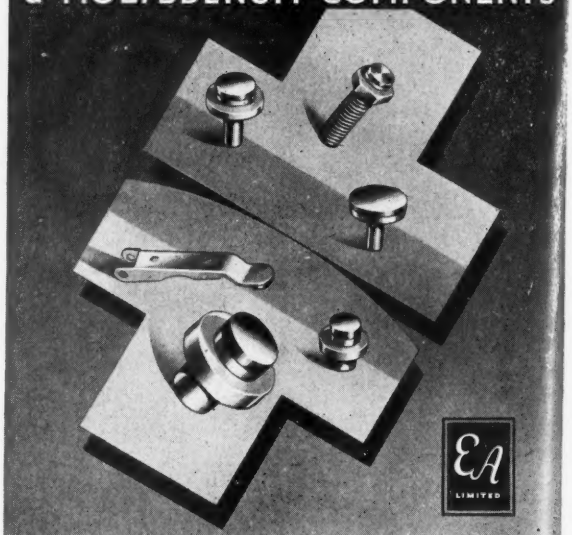
Hants.

Telephone: Christchurch 1011.

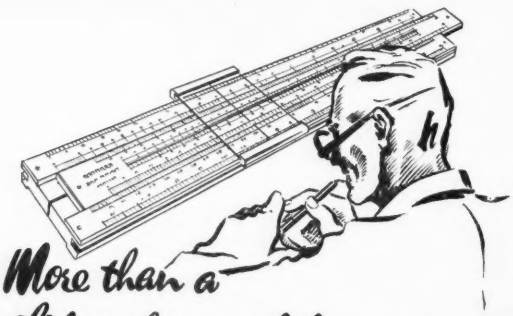
Electrical Insulation Specialists

TUNGSTEN
CONTACTS
AND ALL OTHER TUNGSTEN
& MOLYBDENUM COMPONENTS

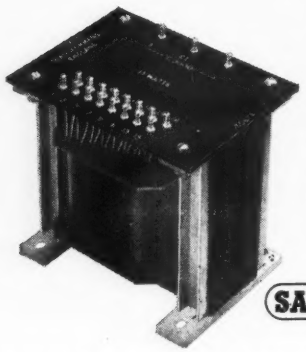


EA LIMITED

ELECTRO-ALLOYS LTD
47, BRUNEL ROAD, LONDON, W.3
Telephone: SHEPHERDS BUSH 3460 & 6306



More than a
slide rule & careful workmanship
is needed for a
SAVAGE
Transformer

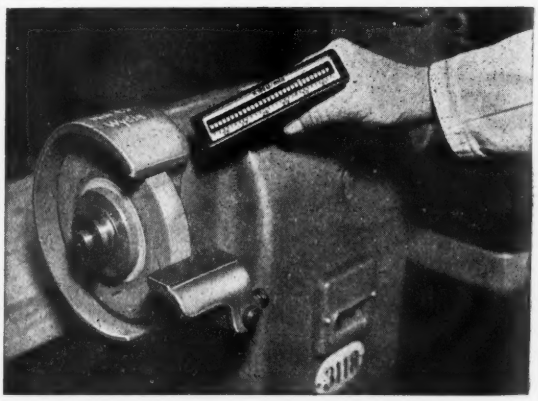


It's the experience which we have gained over so many years which places the Savage Transformers in a class of their own.

SAVAGE TRANSFORMERS OF DEVIZES LIMITED

SAVAGE TRANSFORMERS LTD.
NURSTEED ROAD, DEVIZES, WILTS.
Telephone: DEVIZES 932

HARTMANN & BRAUN
VIBRATION TACHOMETERS

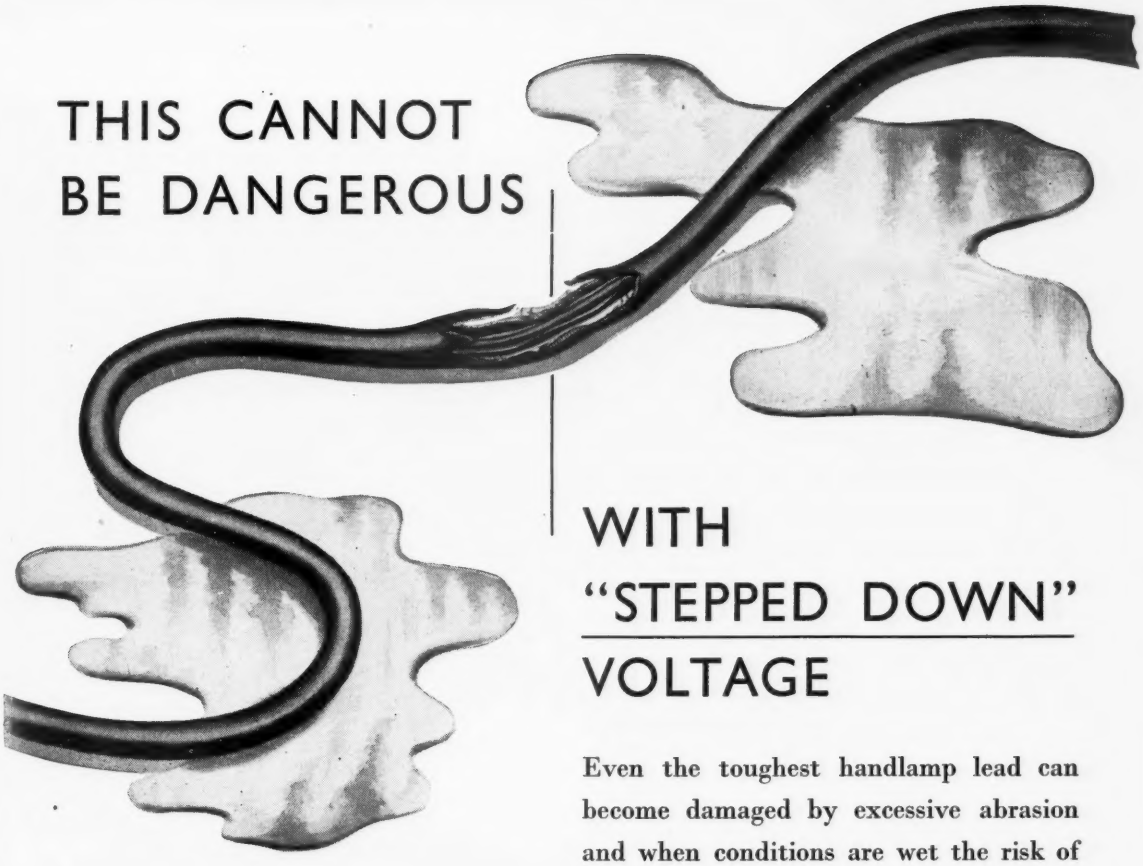


For accurate speed measurements from 780–107,000 r.p.m. by surface contact only. Also Vibration Amplitude Meters. NO MECHANICAL OR ELECTRICAL COUPLINGS!

Apply for details:–

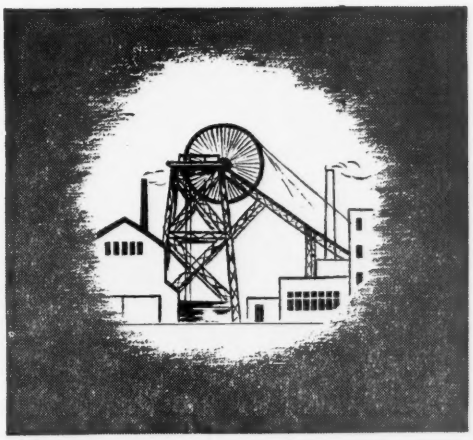
KANDEM ELECTRICAL LTD
711 & 715 FULHAM RD., LONDON, S.W.6
Phone: RENown 2387

THIS CANNOT BE DANGEROUS



WITH "STEPPED DOWN" VOLTAGE

Even the toughest handlamp lead can become damaged by excessive abrasion and when conditions are wet the risk of fatal shock is, of course, far greater. For this reason you cannot afford to overlook the advantages of installing Igranic "Lo-Vo-Lite" low voltage lighting units. For full particulars ask for Publication 68000Z1, free on application to Publicity Dept., Bedford.



Lo-Vo-Lite

LOW VOLTAGE SAFETY LIGHTING FOR WET CONDITIONS IN COLLIERY PLANT

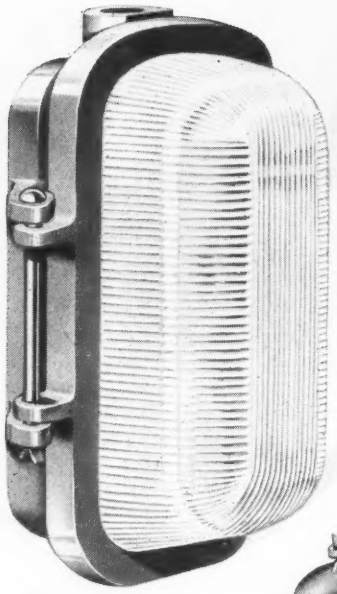
DISTRICT OFFICES: LONDON · BIRMINGHAM
BRISTOL · CARDIFF · GLASGOW · LEEDS
MANCHESTER · NEWCASTLE · SHEFFIELD

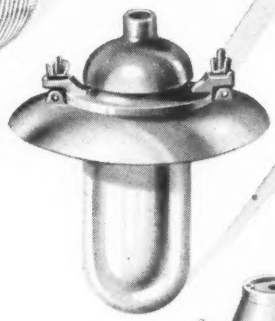
ELECTRIC IGRANIC CO. LTD.

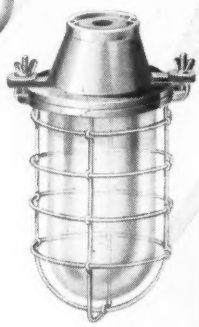
HEAD OFFICE AND WORKS · BEDFORD

Walsall

Industrial Lighting Fittings







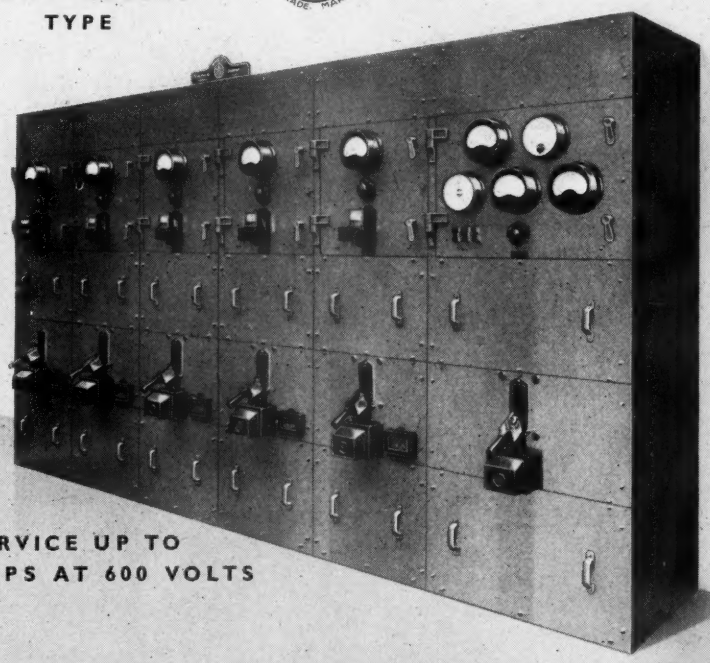
Superior Industrial Lighting Fittings
— for quick and easy fitting, efficiency and durability.
Attractive dove grey finish, or galvanised for exterior work.
The large and comprehensive range covers every requirement in its almost infinite variety of types
— Wellglass Lighting Fittings, Handlamps, Brass Ships Fittings
— Bulkhead Lighting Fittings, Surface, Flush and Floor Patterns
— Reflectors
— "Walflect" Lighting Brackets
— attendant lampholders and accessories.

WALSALL CONDUITS LTD · EXCELSIOR WORKS · WEST BROMWICH · STAFFS

CUBICLE SWITCHGEAR

FRONT ACCESS TYPE

REGISTERED M E C TRADE MARK



FOR SERVICE UP TO 5000 AMPS AT 600 VOLTS

MUDIE'S ELECTRICAL CO. LTD., BIRMINGHAM 28

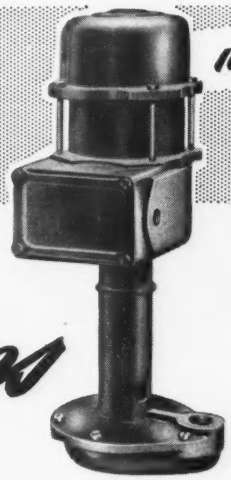
WRIGHT

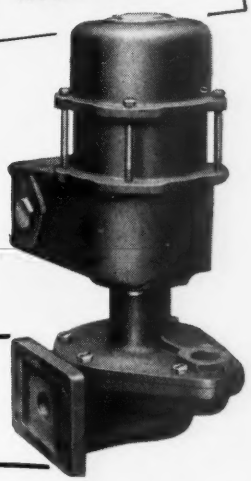
'ELECTROSUDS' Pumps

IMMERSED TYPE

IMMERSED TYPE WITH SWITCH

'T' TYPE FOR EXTERNAL MOUNTING





A wide selection of types in three sizes

"MINIM" 3 GALLONS PER MINUTE AT 6ft. HEAD.
"MINOR" 8 GALLONS PER MINUTE AT 10ft. HEAD.
"MAJOR" 25 GALLONS PER MINUTE AT 12ft. HEAD.

WRITE FOR LIST No. 104.

We also manufacture: Standard A.C. and D.C. Motors, Diesel Engine or Electric Motor-driven Pumping Sets, and Compressor Sets, A.C. and D.C. Generators, Motor Generator Sets, Frequency Changers, Buxton Certified Flameproof Motors.

WRIGHT ELECTRIC MOTORS (HALIFAX) LTD.

MANUFACTURING ELECTRICAL AND MECHANICAL ENGINEERS

HALIFAX. Grams: "MOTOR" Halifax. Phone: Halifax 60201-2

Fittings for every purpose

The Crompton 'New-Range' fluorescent fittings bring an entirely new concept to industrial lighting. They start as a single foundation unit, for either one or two tubes, which may speedily be built up to any one of FIFTY-FOUR different types of fitting to suit every conceivable purpose. The 'New-Range' fittings are equipped with the famous Crompton visible starting unit or snap start gear and are silent in action. Finished in 'Permawhite,' with reflectors of 'Permawhite' vitreous enamel or 'Perspex'.

Write now for full informative literature.

BY APPOINTMENT MANUFACTURERS OF ELECTRIC LAMPS TO THE LATE KING GEORGE VI

Crompton 'NEW-RANGE'

The lighting fittings you helped to design

ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2 TEL: CHANCERY 3333

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insercions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

THE ELECTRICITY TRUST OF SOUTH AUSTRALIA

Port Augusta "B" Power Station

Turbo-Alternator Plant

TENDERS are invited for the manufacture, delivery, erection, testing and setting to work of the following turbo-alternator plant for Port Augusta "B" Power Station:—

Number of Units 2 or 3
Capacity (M.C.R.) 60 Megawatts
Steam Conditions 900 p.s.i., 900° F.

Specifications are available at the offices of the Design Engineer, Hindmarsh Buildings, Grenfell Street, Adelaide, and Messrs. Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1.

Tenders close on Thursday, 3rd February, 1955, at 9.30 in London and 5 p.m. in Adelaide. No tender will necessarily be accepted. Tenders must be submitted in triplicate. Two copies to be lodged with the Chairman, Purchasing and Contracts Committee, Electricity Trust of South Australia, Kelvin Building, North Terrace, Adelaide, South Australia, and one copy to be lodged with Messrs. Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, Westminster, S.W.1, London, by the closing date and time specified. 5347

LLANDUDNO URBAN DISTRICT COUNCIL

Street Lighting

Substitution of Electric for Existing Gas Lighting

TENDERS are invited for the supply, erection and wiring of concrete lighting columns complete with lanterns for 22 Class A and 136 Class B columns.

Specification and bill of quantities, together with general conditions of contract and form of tender, may be obtained from, and drawings may be inspected at the office of, the Engineer and Surveyor, Town Hall, Llandudno.

Tenders, in plain envelopes endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than noon on Friday, 29th October, 1954.

The Council do not bind themselves to accept the lowest or any tender.

REUBEN D. JONES,
Town Hall, Clerk to the Council.
Llandudno.
29th September, 1954. 5401

BOROUGH OF CHELMSFORD

Provision and Erection of Class A Street Lamps

TENDERS are invited for the provision and erection of 118 Class A Street Lamps on various classified roads within the Borough of Chelmsford.

A copy of the specification and form of tender may be obtained from the Borough Engineer and Surveyor, Chelmsford, upon payment of a deposit of two guineas, which will be refunded upon receipt of a bona fide tender not subsequently withdrawn. Drawings may be inspected at the Borough Engineer and Surveyor's Office, during normal office hours.

Tenders in the envelopes provided should reach the undersigned not later than noon on Monday, 25th October, 1954.

B. A. FRANCIS,
Municipal Offices, Town Clerk.
Duke St., Chelmsford.
1st October, 1954. 5428

H

LONGBENTON URBAN DISTRICT COUNCIL

Electrical Installations—Conversions

THE Council invite tenders from Registered Electricians for installations, i.e., conversion schemes as follows:—

Contract No. 44.	Houses.
Burnside Avenue, Annitsford ...	54
Rocket Way, etc., Forest Hall ...	150
Laurel Avenue and Place, etc., Palmersville	70
St. Aidans Square, etc., Holystone	38
	312

General conditions, specifications, schedules and form of tender can be obtained from Mr. A. E. Sweetman, M.I.Mun.E., Engineer and Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne, on payment of a deposit of £2 2s., returnable only upon receipt of a bona fide tender, not subsequently withdrawn, and the return of all documents.

Drawings can be inspected at the office of the Engineer and Surveyor, but tenderers are advised to examine the houses prior to the submission of their tenders.

Sealed tenders in plain envelope, endorsed "Electrical Installations—Conversions," must be delivered to the undersigned not later than 10 a.m. on Monday, 25th October, 1954.

The Council do not bind themselves to accept the lowest or any tender and reserve the right to divide the contract should they so desire.

G. HARRISON,
P.O. Box 1, Clerk of the Council.
Council Offices,
Forest Hall,
Newcastle-on-Tyne, 12. 5345

BOROUGH OF TWICKENHAM

Street Lighting Improvement, Hampton Area, Stage 1, Group A Lighting

TENDERS are invited for the supply and erection of 335 Street Lighting Units comprising lanterns and auxiliary gear for Sodium H.P.M.V. and/or Fluorescent Lamps on R.C. columns and existing trolley-bus poles.

Plans may be seen, and conditions of contract, specification and bills of quantities obtained, upon application to the Borough Engineer, Municipal Offices, Twickenham, and the payment of a deposit of £2, which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders must be delivered to the undersigned in the envelope provided not later than 10 a.m. on Thursday, 4th November, 1954.

The Corporation do not bind themselves to accept the lowest or any tender.

W. H. JONES,
Municipal Offices, Town Clerk.
Twickenham. 5427

BOROUGH OF WREXHAM

Supply of 272 Consumer Units

TENDERS are invited for the supply of 272 Consumers, combined switch and fuse chambers and cabinets.

Applications for tender forms must be made to the Borough Engineer and Surveyor, 31, Chester Street, Wrexham.

Completed tenders must be returned in the envelope provided to the undersigned not later than 12 noon, Monday, 25th October, 1954.

The Council does not bind itself to accept the lowest or any tender.

PHILIP J. WALTERS.
Guildhall, Town Clerk.
Wrexham.
30th September, 1954. 5429

URBAN DISTRICT COUNCIL OF ADWICK-LE-STREET

Sodium Discharge Lighting, Great North Road A.1

TENDERS are invited for the lighting of about two miles of Trunk Road as follows:—

(a) Supply of lighting equipment.
(b) Supply and erection of columns and installation work.
(c) Supply and laying of cables.

Drawings, specifications, bills of quantities and form of tender may be obtained from, and the conditions of contract inspected at, the office of the Engineer and Surveyor at the address below, on deposit of two guineas, returnable only on receipt of a bona fide tender and the return of all documents.

Tenders in sealed envelopes not bearing any mark indicating the name of the sender, but endorsed "Great North Road Lighting," must reach the undersigned not later than Saturday, 30th October, 1954.

The Council does not bind itself to accept the lowest or any tender.

C. R. MARSHALL,
Council Offices, Clerk to the Council.
Adwick-le-Street,
Nr. Doncaster.
27th September, 1954. 5384

ISLE OF ELY COUNTY COUNCIL

Divisional Police Station and Court House, Wisbech

TENDERS are invited from Electrical Contractors for the Electrical Installation in the Divisional Police Station and Court House, Wisbech, now in the course of erection.

The building will consist of basement and two floors with approximately 17,000 sq. ft. total floor area.

Total connected load will be approximately 200 kW.

Applications to tender, accompanied by a cheque for £2 2s. payable to the Isle of Ely County Council, must be received by the County Architect, County Hall, March, not later than Saturday, 16th October, 1954. Deposits will be returned on receipt of a bona fide tender.

The latest date for receipt of tenders is Saturday, 6th November, 1954.

The successful contractor will be required to enter into a formal contract wtih the Isle of Ely County Council. A copy of the form of contract may be seen at the office of the County Architect during the usual office hours. The Council do not bind themselves to accept the lowest or any tender.

R. F. G. THURLOW,
Clerk of the County Council.
5385

BURGH OF MAYBOLE

Street Lighting: Relighting of Route A.77 through Maybole

TENDERS are invited for the supply, erection and putting into service of a system of Fifty-two Lighting Points on Route A.77 in the Burgh of Maybole.

Plans, specifications and conditions of contract may be inspected and bills of quantities and form of tender obtained at the Burgh Surveyor's Office.

Tenders in a plain sealed envelope endorsed "Relighting Route A.77" to be returned to D. Briggs, Esq., Town Clerk, Maybole, not later than Friday, 29th October, 1954.

The Council do not bind themselves to accept the lowest or any tender.

A. A. ALEXANDER,
9, High Street, Burgh Surveyor.
Maybole.
24th September, 1954. 5346

ELLESMERE PORT URBAN DISTRICT COUNCIL

Contract No. 162

Public Lighting Installation, Chester/Birkenhead Road (A.41) at Childer Thornton

TENDERS are invited for the provision and erection of 19 Sodium Discharge Lamps.

The drawings may be seen by appointment, and a set of tender documents, comprising the Institution of Electrical Engineers recommended conditions of contract, specification, bills of quantities and form of tender, may be obtained at the offices of the Council's Engineer and Surveyor, Queen Street, Ellesmere Port, on and after Saturday, 25th September, 1954, on payment of a deposit of two guineas, which deposit will be refunded on the return of the contract documents, or, in the case of a bona fide tender which is accepted and not subsequently withdrawn, on completion of the formal contract between the Council and the successful tenderer.

Sealed tenders in the plain official envelope provided, together with contract documents, must reach the undersigned by not later than 5 p.m. on Monday, 11th October, 1954. Tenders received after this date and time will not be considered by the Council, and the Council do not bind themselves to accept the lowest or any tender.

P. J. HODGES,
Cerk of the Council.

Council Offices,
Whitby Hall,
Ellesmere Port, Cheshire.
21st September, 1954. 5260

CITY OF BIRMINGHAM

To Electrical Contractors

THE House Building Committee invite separate tenders for electrical installation work at (a) Contract 306, Brandwood Park Estate, 12 Dwellings, 10 Shops; (b) Contract 307, Gt. Francis Street, 6 Dwellings, 6 Shops; (c) Contract 342, Rednal House Estate, 15 Dwellings, 12 Shops.

General conditions (which include the Corporation's usual Fair Wages and Conditions of Labour Clause) may be inspected at the Mechanical and Public Lighting Department, 38, Cambridge Street, Birmingham, 1. Copies of the special conditions, specifications and plans, etc., will be forwarded on payment of £2 2s. for each contract at the office of Sir Herbert J. Manzoni, City Engineer & Surveyor, Civic Centre, Birmingham, 1, to whom all cheques should be made payable. The deposit will be returned on receipt of a bona fide tender.

Applications for documents should be made not later than Saturday, 16th October, 1954.

Tenders, enclosed in the envelope provided for the purpose, must be sealed and delivered to the Town Clerk's Office (Room No. 23), Council House, Birmingham, 1, not later than twelve noon on Monday, 1st November, 1954, when they will be opened. Tenders received after that time will be rejected.

The Committee do not bind themselves to accept the lowest or any tender.

J. F. GREGG,
Town Clerk.

Council House,
Birmingham, 1. 5430

CITY OF BIRMINGHAM

To Heating and Electrical Contractors

THE Welfare Committee invite tenders for the installation of (a) Central Heating and Hot Water Services and (b) Electric Lighting and Power, at the Aged Persons Home, Oakdene, 328, Hagley Road, Birmingham, 17.

General conditions (which include the Corporation's usual Fair Wages and Conditions of Labour Clause) may be inspected at the Mechanical and Public Lighting Department, 38, Cambridge Street, Birmingham, 1. Copies of the special conditions, specifications and plans, etc., will be forwarded on payment of £2 2s. for each contract at the office of Sir Herbert J. Manzoni, City Engineer & Surveyor, Civic Centre, Birmingham, 1, to whom all cheques should be made payable. The deposit will be returned on receipt of a bona fide tender.

Applications for documents should be made not later than Saturday, 16th October, 1954.

Tenders, enclosed in the envelope provided for the purpose, must be sealed and delivered to the Town Clerk's Office (Room No. 12A), Council House, Birmingham, 1, not later than twelve noon on Monday, 1st November, 1954, when they will be opened. Tenders received after that time will be rejected.

The Committee do not bind themselves to accept the lowest or any tender.

J. F. GREGG,
Town Clerk.

Council House,
Birmingham, 1. 5431

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

THIRD ASSISTANT ENGINEER (Construction). Applicants must have had a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Experience in 33-kV work and primary substation construction will be of advantage.

Salary N.J.B. Class K, Grade 10, £719/£750 per annum.

CASTLEFORD DISTRICT.

ASSISTANT INSTALLATION ENGINEER. Applicants must have had a sound technical education and practical experience in electrical contracting work of all types. They must be capable of preparing and supervising schemes for all classes of domestic, commercial and industrial installations, including specifications, estimates and tenders. Experience in electrical appliance repairs would be considered an advantage. Applicants must have had considerable experience in the control of workmen.

Salary N.J.B. Class F, Grade 10, £577/£598 per annum.

WAKEFIELD AND CASTLEFORD DISTRICTS.

GENERAL ASSISTANT DISTRICT ENGINEERS. Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district to which they are appointed and undertake standby duties.

Applicants must hold at least Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class F, Grade 11, £548/£565 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 21st October, 1954.

No. 3 (Sheffield) Sub-Area

SHEFFIELD NORTH DISTRICT.

GENERAL ASSISTANT DISTRICT ENGINEER. Applicants should hold at least the Higher National Certificate in Electrical Engineering and should have had construction experience on overhead and underground distribution systems up to 11 kV. Experience on operation under fault conditions will be an advantage.

Salary N.J.B. Class K, Grade 11, £678/£704 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 21st October, 1954.

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT ENGINEER (Operation and Maintenance). Candidates should be fully experienced in the operation and maintenance of H.V. and L.V. overhead and underground transmission and distribution systems, substation plant and ancillary equipment. They should be suitably qualified and hold at least the Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class H, Grade 10, £641/£667 per annum.

SCUNTHORPE DISTRICT.

SECOND ASSISTANT DISTRICT ENGINEER. Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications. They must have had a sound training and extensive experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems both in urban and rural areas, substation plant and ancillary equipment.

Salary N.J.B. Class F, Grade 7, £697/£718 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 21st October, 1954.

No. 4 (Leeds) Sub-Area

GENERAL ASSISTANT ENGINEER (Operation and Maintenance). Applicants should have had experience in the operation and maintenance of substations, underground and overhead mains in a large urban area and on a rural network.

Graduate Membership of the Institution of Electrical Engineers or an equivalent qualification is essential.

Salary N.J.B. Class K, Grade 13, £583/£605 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 21st October, 1954.

No. 1 (Bradford) Sub-Area

KEIGHLEY DISTRICT.

FIRST ASSISTANT DISTRICT ENGINEER. Applicants should hold Corporate Membership of the Institution of Electrical Engineers or equivalent qualifications and have had extended experience in the operation, maintenance, development and construction of large high and low-voltage A.C. industrial systems.

Experience of D.C. general supply systems with rotary convertor and rectifier equipments will be an advantage.

Salary N.J.B. Class E, Grade 5, £740/£774 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 21st October, 1954. 5405

COUNTY BOROUGH OF BRIGHTON EDUCATION COMMITTEE

Brighton Technical College

Principal: G. E. Watts, M.A., Ph.D.(Cantab.), B.Sc.(Lond.), F.R.I.C.

APPLICATIONS are invited from suitably qualified persons for the following appointments:—

(a) HEAD OF ELECTRICAL ENGINEERING DEPARTMENT. Salary in accordance with Burnham Technical Scale for Head of Dept. Grade II.

(b) LECTURER IN ELECTRONIC ENGINEERING, with experience of teaching electronics to Final Degree standard. Salary in accordance with Burnham Technical Scale for Lecturers.

Further particulars and application forms may be obtained from the undersigned. Completed forms should be returned to the Principal, Brighton Technical College, Richmond Terrace, Brighton, 7, within fourteen days.

W. G. STONE,
Director of Education.

Education Office,
54, Old Steine, Brighton, 1. 5387

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

ASSISTANT ENGINEER (INSTRUMENTS), DRAKELOW POWER STATION (Vacancy No. 151/54/ER). Applicants should be experienced on Bailey Automatic Combustion Control and also Kents, Cambridge and Foster Instrumentation of all types. A knowledge of Turbine Supervisory Equipment would also be an advantage.

Salary in accordance with Class J, Grade 10 (£680-£706 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18th October, 1954.

BOILER HOUSE SHIFT CHARGE ENGINEER, NORTH WILFORD POWER STATION, NOTTINGHAM (Vacancy No. 155/54/ER). Applicants should have had a sound technical training, a good general engineering experience and a knowledge of the control and operation of large pulverised fuel boilers and associated equipment. Preference will be given to candidates who are in possession of technical qualifications admitting to Corporate Membership of a recognised professional Institution.

Salary in accordance with Class K, Grade 9 (£766-£796 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th October, 1954.

SHIFT CHARGE ENGINEER, BURTON-ON-TRENT POWER STATION (Vacancy No. 156/54/ER). A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear is required. Appropriate qualifications an advantage.

Salary in accordance with Grade E, Class 7 (£649-£681 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th October, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form, A.E.6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

1st October, 1954.

5433

BRITISH ELECTRICITY AUTHORITY

South West Scotland Division

Shift Charge Engineer

APPLICATIONS are invited for the position of SHIFT CHARGE ENGINEER at Clydesmill Generating Station, Cambuslang.

The post will be superannuable and the salary in accordance with Class J, Grade 7, of the National Joint Board Schedule A. Applicants should have attained the Higher National Certificate in Electrical or Mechanical Engineering and have had power station control room experience.

Applications on Form AE.6, which may be obtained from the Divisional Office of the Authority, should be forwarded to the Divisional Secretary, 168, Broomhill Drive, Glasgow, W.1, before Friday, 22nd October, 1954. 4560

MIDLANDS ELECTRICITY BOARD

GENERAL ASSISTANT DISTRICT ENGINEER required in the Redditch District of the Worcester and District Sub-Area.

Applicants should have received a sound training in supply engineering and have experience in overhead and underground H.V. and L.V. systems, design and operation. Technical qualifications desirable. Salary £524/£540 per annum (N.J.B. Grade E.11). Superannuable.

Apply in writing within 14 days to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS, Secretary.

5446

SOUTH EASTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER, Central Sussex District. Salary £649 p.a. rising to £681 under N.J.B. Schedule, Class E, Grade 7. Applicants should have suitable technical qualifications and have had training and experience in the planning, construction, operation and maintenance of underground and overhead distribution systems up to 33 kV. The person appointed will be required to reside in the district and rented flat accommodation will be available from 1st February, 1955.

Applications, naming 2 referees, to Arthur Barnes, M.I.E.E., Central Sussex Manager, SEEBoard, Electra House, Church Rd., Haywards Heath, Sussex, by 20th October, 1954.

DEMONSTRATOR, Reigate District. Salary £400 × £20-£480 × £10-£490 p.a. under N.J.C., Grade 1. Applicants should have showroom experience, be capable of demonstrating electrical appliances both in showrooms and on consumers' premises, and possess a recognised diploma or certificate in domestic science and the E.A.W. certificate.

Applications on forms from C. Rowbotham, M.I.E.E., District Manager, SEEBoard, 6/8, Linkfield Corner, Redhill, Surrey, to be returned naming 2 referees by 20th October, 1954.

STORES SUPERVISOR, West Kent District. Salary £545 × £20-£605 p.a. under N.J.C., Grade 3, plus London weighting. Superannuable. Experience in the supervision of modern stores methods and layout is desirable. A good knowledge of electrical engineering stores, cables, wiring materials and domestic apparatus is essential.

Applications on forms from P. S. Watson, M.I.E.E., West Kent District Manager, SEEBoard, 270, High St., Orpington, Kent, by 20th October, 1954.

SHOWROOM ASSISTANT, West Kent District. Salary £170 at age 16 to £395 at 26, rising subject to satisfactory service to £470 p.a. plus London Weighting. Superannuable. Experience of showroom sales, tariffs and apparatus desirable.

Applications on forms from P. S. Watson, M.I.E.E., West Kent District Manager, SEEBoard, 270, High St., Orpington, Kent, by 20th October, 1954.

ELECTRICIAN, Crawley District. Wages 3s. 9d. per hour for 44-hour, 5-day week, under N.J.I.C. Agreement. Experience of refrigerator maintenance and repairs an advantage.

Applications, naming 2 referees, to F. A. Avery, A.I.E.E., District Manager, SEEBoard, 55, High St., Crawley, by 20th October, 1954.

A. L. BURNELL,
Secretary.

5434

SOUTH WESTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER, PLYMOUTH. Salary, N.J.B., Class F, Grade 4, £850 to £887 p.a.

Duties include responsibility to the District Manager for all commercial negotiations with consumers, including the technical aspects; supervision of service centres and outside sales staff; control of installation contracting and consumers' service; organisation of exhibitions, demonstrations and publicity; preparation of revenue estimates. Candidates should possess extensive knowledge of, and have had wide experience in, the commercial side of the industry and be capable of promoting a progressive commercial development policy. Corporate membership of the I.E.E. is desirable.

Application forms obtainable from the Sub-Area Manager, 57, Paul Street, Exeter, should be returned by 20th October, 1954. 5435

BRITISH ELECTRICITY AUTHORITY

CHIEF Accountant's Department, Headquarters, London, invite applications from qualified accountants for two appointments as ACCOUNTANTS-IN-CHARGE. For one appointment experience in an Area Electricity Board would be an advantage.

Salary provisionally within N.J.M. Scale 2, £1,350-£1,500 inclusive.

Applications, stating age, qualifications, experience and present position and salary, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 18th October, 1954. Quote ref. ER/529. 5388

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the following appointments:—

STATION CHEMIST, Kirkstall Power Station and Whitehall Road Power Station, Leeds. Salary £817-£852 per annum, Class J, Grade 7, National Joint Board Agreement.

Applicants should hold a Higher National Certificate in Chemistry and have had previous power station experience, preferably associated with pulverised fuel operation.

The appointment will be located at Kirkstall Power Station and duties will include the chemical servicing of Whitehall Road Power Station.

MAINTENANCE ENGINEER (Electrical), Bradford Power Station. Salary £787-£818 per annum, Class G, Grade 6, National Joint Board Agreement.

Applicants should possess a Higher National Certificate in Mechanical or Electrical Engineering or equivalent qualification, and should have had experience in the operation of a modern power station.

GENERAL ASSISTANT ENGINEER (Development), Technical Department, Divisional Headquarters, Leeds. Salary £501-£714 per annum, Class AX/EX, Grade 8, National Joint Board Agreement.

Applicants should possess technical qualifications leading to Corporate Membership of the Institution of Electrical Engineers, and should be capable of carrying out calculations involved in studies on interconnected power systems and preliminary investigation of schemes for system development.

Application forms obtainable from the Divisional Secretary (Establishments), British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds, 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.

5445

HERTFORDSHIRE COUNTY COUNCIL

Hatfield Technical College

Principal: Dr. W. A. J. Chapman, M.Sc.

OWING to expansion of work in the College the following vacancies arise. Successful candidates will be required to commence duties not later than 1st January, 1955.

1. TECHNICAL AND DESIGN ENGINEERING DEPT. (Ref. T/D).

ASSISTANT GRADE B in Electrical Engineering to teach Electrical Technology and Telecommunications up to Final Degree standards. Candidates should be graduates in electrical engineering, or possess equivalent professional qualifications, and have appropriate industrial experience.

2. WORKS AND PRODUCTION ENGINEERING DEPT. (Ref. W/P).

ASSISTANT GRADE B to teach up to Higher National Certificate standard (Mechanical Engineering) and Final City and Guilds. Candidates should have had suitable industrial experience.

Salary Grade B of the Burnham Technical Scale (1954), viz., £528 × £25 to £820 per annum plus allowances for recognised qualifications and approved industrial experience.

Further particulars and application form obtainable from the Registrar, Hatfield Technical College, Roe Green, Hatfield, Herts. 5368

METROPOLITAN-VICKERS ELEC. CO. LTD.

require DESIGN DRAUGHTSMEN for METALCLAD and HIGH VOLTAGE SWITCHGEAR DEVELOPMENT.

Senior and junior positions available according to experience.

Applications, giving details of experience, age, etc., should be addressed to the Personnel Manager, Metropolitan-Vickers Elec. Co. Ltd., Trafford Park, Manchester, 17.

4912

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for post (a) and Corporate Membership for post (b) an advantage.

(a) ASSISTANT ENGINEER (Instruments), Bankside Generating Station (Vacancy No. 54/837). Applicants to be capable of maintaining calibrating and testing instruments relating to steam and water flows, pressure and temperature indicators, similar to those used in boiler and turbine plant, and should have received a sound technical training. Salary Class H, Grade 12 = £593 5s. p.a.

Applicants for Vacancy No. 54/604 will be considered and need not re-apply.

(b) BOILER HOUSE SUPERINTENDENT, Deptford East Generating Station (Vacancy No. 54/838). Wide experience necessary in the efficient operation and maintenance of large modern generating plant and auxiliary equipment, together with ability to plan and organise work to a strict time schedule. Experience in control of labour with modern concept of management essential. Salary Class K, Grade 6 = £982 16s. p.a.

Applicants for Vacancy No. 54/645 will be considered and need not re-apply.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box No. 136, Generation House, Great Portland Street, London, W.1, and be received within 14 days of this advertisement. 5403

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 98/54

APPLICATIONS are invited for the following superannuable N.J.B. appointments in the Divisional Drawing Office, Construction Department:—

SENIOR DRAUGHTSMAN (Mechanical and Electrical). Salary Schedule D, Grade 5, £567-£671 per annum.

ENGINEERING DRAUGHTSMAN (Mechanical and Electrical). Salary Schedule D, Grade 6, £433-£567 per annum.

Candidates should be suitably qualified and have had experience in one or more of the following:—

(1) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(2) H.P. and L.P. steam and feed pipework, condensing plant and feed heating systems.
(3) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.
(4) Preparation of layouts and diagrams of E.H.T. and L.T. switchgear transformers, cables and overhead lines. Knowledge of protective gear systems advantageous.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 18th October, 1954. 5386

BRITISH ELECTRICITY AUTHORITY

South Western Division

SHIFT CHARGE ENGINEER required at Castle Meads Generating Station. Superannuation scheme. Salary N.J.B. Class E, Grade 7, £649-£681.

Applicants should have had considerable experience in a modern generating station. Graduate or Corporate Membership of a recognised Engineering Institution or equivalent desirable.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 16th October, 1954. 5441

ILFORD AND BARKING JOINT SEWERAGE COMMITTEE

Maintenance Electrician

APPLICATIONS are invited for the appointment of a MAINTENANCE ELECTRICIAN at the Ilford and Barking Joint Sewerage Pumping Station, Alfred's Way, Barking.

Regular apprenticeship essential with subsequent experience on diesel electric generating plant, 1,000 b.h.p., and large electrically driven pumping equipment, 2,000 b.h.p., A.C. 400 v., 3-phase, 50 cycles.

Present wages £9 11s. 6d. gross per week of 44 hours, including 10s. on-call allowance. A new house will be provided on the site at a rental of 25s. per week. Superannuated post, paid annual holiday, sickness and other benefits.

Applications, stating age and details of experience, with copies of supporting documents, to be received by the Clerk to the Committee, Town Hall, Ilford, on or before 23rd October, 1954.

Further details, if required, can be obtained from Superintendent (Telephone, Rippleway 1670). 5402

STANDARD TELEPHONES AND CABLES LTD.

Rectifier Division, Boreham Wood, Herts

invite applications from

DEVELOPMENT ENGINEER
(Ref. B.1/D2).

B.Sc. or H.N.C. (Elec.), for process and electrical studies in the development of selenium metal rectifiers. At least two years' experience in physical or electrical laboratory.

PHYSICIST
(Ref. B.3).

B.Sc. or equivalent, for work on new development project. At least two years' experience in high-vacuum techniques or optical and electrical measurements.

This Division will shortly transfer to HARLOW NEW TOWN, ESSEX. Selected applicants will be required to work in Boreham Wood until transfer. Houses in Harlow can be provided on engagement with free daily transport to and from Boreham Wood.

Please write, quoting appropriate reference number and stating age, qualifications and experience, to the

PERSONNEL MANAGER
STANDARD TELEPHONES AND
CABLES LTD.
WARWICK ROAD
BOREHAM WOOD, HERTS

5423

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area (141/54 R)

Meter Repairers (Mechanicians)

APPLICATIONS are invited for the positions of METER REPAIRERS (Mechanicians) in the Meter Testing Station located at St. Mary's Road, Luton.

The rate of pay, at present 3s. 9d. per hour for a 44-hour week, and conditions of service will be in accordance with the National Joint Industrial Council Agreement for the Electricity Supply Industry.

Applications by letter, stating age, education, experience and details of present position, should be submitted to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, within fourteen days of the appearance of this advertisement. 5448

HER MAJESTY'S COLONIAL SERVICE

Electrical Engineer (Special Temporary Staff), P.W.D., Uganda

DUTIES will include, under supervision, the preparation of an electrical installation scheme including drawings, schedules, specifications and quantities for lighting in hospitals, schools, streets and industrial premises; power in workshops, pumping stations, etc., and overhead distribution. The officer will be trained to undertake accident investigations and factory investigations in connection with electricity supply and installations.

Appointment is on contract for 30-36 months in the first instance in the salary range £884-£1,670 per annum gross, inclusive of temporary cost-of-living allowance of 35% of basic salary subject to maximum of £350 per annum. An outfit allowance of £30 is payable on salaries up to £1,134. Free first class sea passages are provided for the officer, his wife and dependent children up to cost of 3 adult fares. Partly furnished Government quarters are provided if available at a rental of 10% salary. Leave is granted at the rate of 5 days per month of resident service.

Candidates, between 24 and 30 years of age, must be Graduate Members of the Institution of Electrical Engineers and have specialised in electrical installations.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.112/9/06/D11. 5348

AIR MINISTRY

MECHANICAL AND ELECTRICAL ENGINEERS required in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (a) Main Grade, Salary Scale £1,080 to £1,426; (b) Assistant Grade, £702 to £1,080. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long term possibilities. Special allowance up to £1,500 a year according to location, payable in addition to salary during overseas service. Candidates must be natural born British subjects of natural born British parents.

Minimum qualifications and experience for both grades of posts:—

(i) (a) University degree or equivalent diploma in Electrical and/or Mechanical Engineering and at least a two year apprenticeship or (b) Graduate or Corporate Membership of the Institution of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship and (ii) employment in responsible position for minimum of three years with well-established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms, quoting reference D1/54A from M.L. and N.S., Technical and Scientific Register (K.), Almack House, King Street, London, S.W.1. 4942

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD. LIVERPOOL, 7

Draughtsmen

THE expanding programme of the Transmission Department offers vacancies in both senior and junior categories for Draughtsmen with experience in telecommunications or light current engineering.

Positions offered are on the company staff with contributory pension fund and usual staff conditions.

Applicants should write to Personnel Manager, Automatic Telephone & Electric Co. Ltd., Strowger Works, Edge Lane, Liverpool, 7, giving full details of age, qualifications and experience.

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BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

JUNIOR ENGINEERS (S/13.576).

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for junior engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Commencing salary within range £402-£556 (N.J.B.), depending on qualifications, experience and position to which appointed.

ASSISTANT SHIFT CHARGE ENGINEER, Swindon (S/13.577).

Applicants should have had previous experience in a modern generating station. Manufacturing works experience will be an advantage. Preference will be given to those who possess either qualifications and experience leading to corporate membership of a recognised professional institution, or who are studying for the examinations of an institution.

Salary N.J.B. Class E, Grade 9 (£587-£600).

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned not later than 20th October, 1954. 5447

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area

Assistant Engineer (Commercial), Bedford District (133/54N)

CANDIDATES must have had experience of tariffs associated with industrial and commercial consumers and must be able to advise on and estimate for installations in such consumers' premises including power factor correction and thermal storage heating. A knowledge of street lighting would be an advantage and preference will be given to those holding the Higher National Certificate in Electrical Engineering.

Salary will be in accordance with Class F, Grade 9 of the National Joint Board Salary Agreement commencing at £607 and future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the District Manager, Bedford, Eastern Electricity Board, Prebend Street, Bedford, within fourteen days of the appearance of this advertisement. 5449

BRITISH ELECTRICITY AUTHORITY

Southern Division (S/13.575)

APPLICATIONS are invited for a post as ASSISTANT CHEMIST, DIVISIONAL LABORATORY, Divisional Headquarters, Portsmouth.

Applicants should have a wide experience of fuel, oil and water analysis, either in industry or generating stations, and preferably have some experience in laboratory work connected with atmospheric and river pollution. Some experience in metallurgical analysis would be an added advantage.

Candidates should be of University degree standard in chemistry or possess equivalent qualifications.

Salary within Grade AX/CX 8, £501-£675.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 20th October. Please quote reference ER. 5450

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Lanarkshire Sub-Area

Third Assistant District Engineer, Uddingston District
Third Assistant District Engineer, Motherwell District

APPLICATIONS are invited for the above appointments. Candidates should preferably be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications.

Applicants should have had a sound engineering training with subsequent experience in the operation and maintenance of H.V. and L.V. switchgear and of overhead and underground distribution systems.

The present classification and grading for each of these appointments is F.9. Salary £607/£629 per annum, which will be subject to the statutory deductions, including superannuation.

The successful candidates will require to reside within a reasonable distance of the respective District offices.

Application forms, which may be obtained from the undersigned or any other Sub-Area Manager, should be returned to this office within 14 days of the date of this notice.

DUGALD SMITH,
Manager.
137, Almada Street,
Hamilton. 5400

NATIONAL COAL BOARD

APPLICATIONS are invited for a superannuable appointment as SITE ENGINEER for work in connection with gas and steam turbine power plants. The successful candidate, although a member of Headquarters Production Engineering Staff, will for the most part be required to work outside London.

Applicants must have wide experience in modern power plant operation, preference being given to those with experience in the design or operation of gas turbines. The duties will involve operation of the plant on site and also visits of considerable duration to manufacturers' works for the shop-testing of the equipment.

The salary will be within a range £1,100 to £1,550 per annum, according to qualifications and experience.

Apply in writing, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London, S.W.1, marking the envelope TT/850. Original testimonials should not be forwarded. Closing date 22nd October, 1954. 5350

BRITISH ELECTRICITY AUTHORITY

HEADQUARTERS, Bankside, London, have vacancies for:—

(a) SENIOR CIVIL ENGINEERING DRAUGHTSMEN (Grade 4).
(b) CIVIL ENGINEERING DRAUGHTSMEN (Grade 6).
(c) ELECTRICAL DRAUGHTSMEN (Grade 6).

Starting salaries according to qualifications and experience:—

Grade 4, £705-£819 inclusive.
Grade 6, £458-£595 inclusive.

Pension scheme, one Saturday morning in four on duty.

Application forms from D. Moffat, Director of Establishments, Winsley Street, London, W.1. Quote Ref. ER./531. 5440

AIR MINISTRY

require in London, provinces and overseas ELECTRICAL ENGINEERING DRAUGHTSMEN in WORKS DEPARTMENT, experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. Salaries up to £780 p.a., starting pay dependent on age, qualifications and experience. Overtime or extra duty allowance payable. Promotion prospects. Posts non-pensionable with long term possibilities. Natural born British subjects only.

Write, stating age, qualifications, employment details, including type of work done, to Ministry of Labour, 236, Walworth Road, London, S.E.17, quoting Order 85.AS. 205

SEMI-CONDUCTORS

THE following personnel are required for development of new types of transistors and other semi-conducting devices, improvements of existing types and development of methods of manufacture:—

DEVELOPMENT ENGINEERS, for work on development and engineering control of production of semi-conducting devices. Qualifications science or engineering degree, preferably with factory experience.

EQUIPMENT ENGINEERS, for development of equipment for assembly and testing. Qualifications engineering degree or H.N. Certificate, preferably with factory experience.

DRAUGHTSMEN, for jig and tool design and machine layout work.

RADIO MECHANICS, for building, calibration and servicing of test equipment, including V.H.F.

Applications, stating age, qualifications and previous experience, to the Superintendent, British Thomson-Houston Co. Ltd., Lutterworth, Rugby. 5034

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the following positions in the Generation Operation Department at Hams Hall "B" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointments.

(a) BOILER HOUSE SHIFT CHARGE ENGINEER, Schedule A, Grade K.9, commencing at £766 per annum. (Vacancy No. 779MD.)
(b) JUNIOR ENGINEER, Schedule A, Grade K.15, £545 per annum. (Vacancy No. 780MD.)

Applicants for these positions should have received a sound technical training and power station practical experience, in particular for (a) in the operation and maintenance of steam generating plant, including a knowledge of pulverised fuel firing and main switchgear.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 23rd October, 1954. 5443

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)

YEOVIL District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 7, Column 1 (£697 per annum). N.J.B. conditions of service.

The duties of the post will be to assist, under the Maintenance and Operation Engineer, with the maintenance of mains and plant and the operation of both the Urban and Rural systems. Applicants should possess suitable technical qualifications and have had experience in the operation and maintenance of switchgear, transformers, cable, overhead lines, etc., up to and including 33 kV. The appointment will involve standby duties.

The successful candidate will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, not later than 22nd October, 1954. 5437

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

JUNIOR ENGINEER (Efficiency) required at Littlebrook Power Station. Preference will be given to those possessing Ordinary National Certificate and who have experience of power station plant.

N.J.B. conditions of service and salary, Class M, Grades 21/17, commencing at £427 p.a., rising to a maximum of £574 7s. p.a. including London allowance.

Written applications should be received by the Station Superintendent, Littlebrook Power Station, Nr. Dartford, Kent, by 16th October. 5424

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 176/54R.: ASSISTANT SHIFT CHARGE ENGINEER, Bolton Generating Station. Salary £641/£667 (G.9).

Vacancy No. 177/54R.: STATION SUPERINTENDENT, Westwood Generating Station, near Wigan. Salary £1,150/£1,300 (N.J.M., Scale 1). Applicants should be qualified engineers with experience in the management of modern steam power plant, preferably p.f., and appreciation of modern concepts of administration, financial control and employee relations.

Vacancy No. 179/54R.: SHIFT CHARGE ENGINEERS (5), Fleetwood Generating Station. Salary £697/£718 (F.7).

Vacancy No. 180/54R.: STATION SHIFT CONTROL ENGINEERS (5), Fleetwood Generating Station. £577/£598 (F.10).

Applications, quoting vacancy number, to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20, by 16th October. 5351

THE GENERAL ELECTRIC COMPANY LIMITED

have a number of vacancies at their Fraser & Chalmers works for both

ELECTRICAL AND MECHANICAL ENGINEERS,

aged 28 to 40, preferably with an Engineering Degree or its equivalent, for development work in connection with nuclear power stations.

Apply giving particulars of training and experience to Personnel Manager, Fraser & Chalmers Engineering Works, Erith, Kent.

5371

ADMIRALTY— ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS required in Experimental Establishments in London, Portsmouth, Weymouth and Gloucestershire areas and Scotland. The majority of the posts are for Engineers and Physicists (particularly with Electronics).

Candidates must be British subjects with an appropriate first or second class honours degree or equivalent high professional attainments.

Salaries: S.S.O. (M) £975-£1,150; S.O. (M) £470-£855. London rates. Somewhat lower in Provinces. All appointments are unestablished (with F.S.S.U.), but with some opportunities to compete for established posts.

Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A.246/52/A. 207

SENIOR TRANSFORMER DESIGNER

required with experience of all types of transformers up to 3,000 kVA. Excellent prospects for an energetic man capable of supervising junior engineers. Excellent working conditions, pension scheme, canteen, etc. West London area. Applications to—Box 5323.

A.C. AND D.C. MOTORS AND GENERATORS

WANTED by Lancashire firm, keen young man with experience on most types of A.C. and D.C. motors and generators, preferably with both manufacturing and repair shop experience, and with test room experience on fractional, small, and medium h.p. machines. A man with an interest in developing into the design field is preferred. This vacancy offers considerable prospects for the right type of applicant.—Box 5472.

ELECTRICITY SUPPLY BOARD, DUBLIN

Vacancy for Communications Technical Assistant

APPLICANTS should possess a City and Guilds Intermediate Certificate for telecommunications engineering and have at least five years' experience on communications work, and also a sound knowledge of carrier telephony, telephone repeaters, automatic telephone systems and teleprinters.

Present inclusive salary scale, £574 to £796 per annum, entry point depending on qualifications and experience. Position pensionable.

Applications stating age, qualifications and details of experience should reach the Personnel Officer, Electricity Supply Board, 27, Lower Fitzwilliam Street, Dublin, before 22nd October, 1954.

PATRICK J. DEMPSEY,
Secretary. 5425

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

TRANSMISSION ENGINEER required, based at Kingston. Candidates should preferably be Corporate Members of the Institution of Electrical Engineers, and should have had wide experience in the construction and maintenance of high voltage systems up to and including 132 kV, comprising transformers, switchgear, transmission lines, cables and ancillary apparatus. The successful candidate will be required to exercise administrative control of the transmission department.

Provisional salary N.J.M. Scale 4, £1,650-£1,800 p.a. inclusive. Applications stating age, present position and salary, and giving full details of qualifications and experience, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 22nd October, 1954. Quote Ref. ER./530. 5439

ADMIRALTY

TEMPORARY PRODUCTION ENGINEERS required. The duties cover variously the production of mechanical, electrical and electronic equipment for H.M. ships and include design for production, advice on production methods, and the preparation of estimates.

Candidates must have served recognised apprenticeship or had equivalent training, and possess a University Degree, A.M.I.Mech.E., A.M.I.E.E., or exempting qualifications. Age not less than 25.

Salary scale £620 to £960. Starting salary from £620 at age 25 up to £860 according to age.

Application forms, quoting ref. D.492/54-A, from M.L.N.S., Technical & Scientific Register (K), Almack House, King Street, London, S.W.1. 5349

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 183/54R. STATION SHIFT CONTROL ENGINEER, Chadderton B Generating Station, near Oldham. Salary £608/£630 (G.10).

Vacancy No. 184/54R. STATION SHIFT CONTROL ENGINEER, Radcliffe Generating Station, near Manchester. Salary £577/£598 (F.10).

Vacancy No. 185/54R. JUNIOR ENGINEER, Meter Section, Technical Department, Offerton, Stockport, for calibration of meters and instruments. O.N.C. (Electrical) desirable. Salary £390/£589 (AX/EX 9).

Apply to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20, before 16th October. Quote Vacancy No. 5438

JOHNSON & PHILLIPS LTD.

have vacancies for DRAUGHTSMEN in their
(a) Junction Box Dept.
(b) Contract Dept.

Applicants in the case of (a) should have experience in cable boxes and accessories, and in regard to (b) experience in overhead lines, wood poles, steel towers, etc. Applications, giving particulars of age, experience and salary expected, to Employment Manager, Johnson & Phillips Ltd., Victoria Way, Charlton, London, S.E.7. 5264

LONDON ELECTRICITY BOARD

Engineer (Operation and Maintenance)

APPLICATIONS are invited for the above position in the Forest District of the North Eastern Sub-Area at South Woodford, London, E.18.

Applicants should have had a sound technical education up to at least National Certificate standard, with practical experience on both D.C. and A.C. distribution systems and with the preparation and keeping of associated records.

The post is graded under Schedule A of the National Joint Board Agreement as Class E, Grade 13, £472 per annum rising to £485 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2 to be returned completed within fourteen days of the publication date of this advertisement. Please enclose addressed envelope and quote ref. V/1823/R on all correspondence. 5444

SOUTH WESTERN ELECTRICITY BOARD

Third Assistant Engineer (Planning), Bristol Sub-Area

SALARY, N.J.B., Class K, Grade 10, £719-£750 p.a.

The successful candidate will be a member of a sub-area rural development team. Duties include the preparation of estimates and capital sanction applications, progressing the rural development programme, supervising construction and responsibility for the work of the remainder of the team.

Applicants should be experienced in survey and planning work connected with all classes of overhead lines and underground mains up to 33 kV, and in the control of men. Possession of at least the Higher National Certificate is desirable.

Application forms obtainable from the Manager, Bristol Sub-Area, Electricity House, Bristol, 1, should be returned by 20th October, 1954. 5436

ADMIRALTY— ROYAL NAVAL SCIENTIFIC SERVICE

EXPERIMENTAL OFFICERS and ASSISTANT EXPERIMENTAL OFFICERS required in Experimental Establishments in London, Portsmouth and Weymouth areas, Gloucestershire and Scotland. The majority of the posts are for Engineers and Physicists (particularly with Electronics).

Candidates must be British subjects. Qualifications, minimum of H.S.C. (pass degree, H.N.C. or near equivalent an advantage).

London salary (men): E.O. £720-£890; A.E.O. (according to age) £290-£645. All appointments are unestablished, but with some opportunities to compete for established posts.

Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A.247/52A. 206

MONMOUTHSHIRE COUNTY COUNCIL

Appointment of Assistant Electrical Engineer

APPLICATIONS are invited for the post of ASSISTANT ELECTRICAL ENGINEER in the County Architect's Department under N.J.C. conditions. Salary £620 to £670 per annum, Grade A.P.T. V.

Forms of application, particulars of post and conditions of service can be obtained from the undersigned.

Applications, together with copies of three testimonials, should be forwarded to the County Architect, Queen's Hill, Newport, Mon., not later than 16th October, 1954.

VERNON LAWRENCE,
County Hall, Clerk of the Council.
Newport, Mon. 5432

SOUTH EAST SCOTLAND ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (Planning), Southern Sub-Area Headquarters. N.J.B. G.7 (£729/£758 p.a.). Candidates (preferably qualified to H.N.C. standard) should have had sound practical training and experience in construction of rural and urban systems.

Applications stating age, qualifications and experience should reach the Board at High Street, Galashiels, within 14 days. 5473

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited for two vacancies in the Aberdeen Power Station:
(1) MAINTENANCE ENGINEER (Electrical).
(2) ASSISTANT MAINTENANCE ENGINEER (Electrical).

Salary will be in accordance with N.J.B. Agreement, Class F. Grade 6, and Grade 8, and the posts are superannuable.

Applications should reach the undersigned by the 22nd October, 1954, giving personal details of age, operation and maintenance experience of power station plant and/or experience in manufacturers' works, and technical education and qualifications.

Applications already received for the original vacancy will still be considered for the additional position now being advertised.

J. E. WHITTAKER,
Area Offices, Area Manager.
Millburn Street,
Aberdeen. 5442

ELECTRICITY SUPPLY BOARD, DUBLIN

Vacancies for Technicians (Classes I and II)

APPLICANTS should have a sound knowledge of automatic telephone exchanges, telephone repeaters, carrier telephony and/or teleprinters.

The rates of pay for Technicians, Classes I and II, are 4s. to 4s. 5d. and 3s. 8½d. to 4s. 0½d. per hour respectively, according to experience, for a 44-hour week.

Applications, stating age, qualifications and details of experience, should reach the Personnel Officer, Electricity Supply Board, 27, Lower Fitzwilliam Street, Dublin, before 22nd October, 1954.

PATRICK J. DEMPSEY,
Secretary. 5404

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT of GENERAL ASSISTANT ENGINEER (INSTALLATION CONTRACTS), SUB-AREA CONSUMERS' ENGINEER'S DEPARTMENT, BOLTON. Applicants should have experience in the preparation of schemes and estimates and the supervision of all types of installation work in industrial and commercial premises and public buildings.

Salary scale £616/£646 p.a., Grade L.13. N.J.B. conditions.

Applications to the Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester, 3, by 16th October, 1954. 5352

BRUCE PEEBLES & CO. LTD., ENGINEERS, EDINBURGH, 5

APPLICATIONS are invited for the post of SENIOR ELECTRICAL DIAGRAM DRAUGHTSMAN, experienced in the preparation of transformer on-load gear control schemes. Experience in the design of control panels and marshalling kiosks would be an advantage but not essential. Salary commensurate with experience.

Candidates should apply, giving full details of previous experience, to Mr. R. W. Flux, Manager, Transformer Department, at the above address. 5370

VENNER LIMITED
require a
TECHNICAL ASSISTANT
in the SALES OFFICE.
Some electrical knowledge essential.
This is a good opportunity for a suitable young man.
Fully detailed applications should be addressed to Personnel Manager,
VENNER LIMITED,
Kingston By-Pass, New Malden, Surrey.
5471

ELECTRONIC MAINTENANCE ENGINEER

required, with good qualifications and experience to cover factory equipment, including electronic control of machine tools and resistance welders. Apply to the Employment Manager, Vickers-Armstrongs Limited, Weybridge Works, Weybridge, Surrey. 5369

A CHIEF development engineer is required by a leading manufacturer of transformers in the London area. The company operates to very high standards, and the appointment calls for an exceptional man, who, apart from the necessary technical qualifications, must be capable of undertaking the direction of all technical research and development functions, and of controlling and co-ordinating the activities of the design department. A salary commensurate with the appointment is envisaged, and the successful applicant will be eligible for the company's pension scheme and staff bonus arrangement. Age, qualifications, and all relevant details to—Box 43, R. Anderson & Co., 14, William IV St., London, W.C.2. 5458

A LEADING aluminium company have a vacancy in their London office for export executive aged 25/35 with previous experience in promotion of export sales, and preferably knowledge of aluminium or wire industry. Write to—Sales Manager, Aluminium Wire & Cable Co. Ltd., 30, Charles II Street, St. James's Square, London, S.W.1. 5372

A PRODUCTION engineer is required by a medium-size company engaged in the manufacture of light electrical and mechanical devices in batch quantities. A broad experience of modern methods and practice in similar production is necessary and the suitable age would be 35/40. This position offers an excellent opportunity for further advancement in works management. The fullest details should be sent in confidence to—Box 5459.

AN opportunity occurs in progressive manufacturing concern in London area for engineer aged 25/35, with electrical or physicist degree, on development and research work on high-frequency telecommunication cable and associated testing equipment. Salary will be commensurate with qualifications and experience. Apply giving full particulars to—Box 5406.

AN unusual opportunity of a really interesting nature with housing assistance if needed. A cost investigation engineer required immediately by progressive company in pleasant country district one hour west of London, making wide range of products using mechanical (e.g., i.c. engines), electrical and hydraulic mechanisms. Duties would entail cost reduction of products following investigation of function, design, purchasing and production. Applicants must have initiative, sound technical and practical training and experience, and should hold at least H.N.C. Men of mature experience and ingenuity only need apply. Good working conditions and prospects. Canteen facilities. Please write giving age, qualifications, married/single, past experience, present salary, to—Box 5407.

APPLICATIONS are invited for the position of assistant electrical engineer with an electricity supply company in Nigeria. Age should not exceed 30 years and Corporate Member or Graduate I.E.E. preferred. Salary £75 per month, length of tour 18 months, free passage, quarters and medical attention. There is also a pension scheme.—Box No. 1040, The E.C. Advertising Co., 54, Old Broad Street, London, E.C.2. 5457

ARMATURE/stator winder required for repair shop. Good prospects and conditions. London area. State experience and age.—Box 5326.

ARMATURE winder required, excellent conditions and rates, 20 mins. from Waterloo. —Max Arc & Electrics Ltd., Terrace Road, Walton-on-Thames, Surrey. 170

ARMATURE and stator winders required immediately. Repair shop experience up to 200 h.p. L.V. and H.T. an advantage. Top rates to right men. Apply in writing with details of past experience to—District Manager, British Electrical Repairs Ltd., Bellotts Road, Bath. 5389

AUTOMATIC TELEPHONE & ELECTRIC Co. Limited have a vacancy in their Transmission Division at Liverpool for a senior estimating engineer. The duties include the preparation of tenders for line and radio communication systems, and a knowledge of current engineering practice in this field is essential. The position is on the established staff, with contributory pension fund and usual staff conditions. Please write to Personnel Manager, Automatic Telephone & Electric Co. Ltd., Edge Lane, Liverpool, giving details of qualifications and experience, age and approx. salary sought. 5316

ASSISTANT engineer experienced in cable laying, overhead transmission lines, and if possible general installation work, for contractors' Midlands office. Possibility of transfer abroad later. Write details age, experience.—Box 5408.

AUTOPHONE Limited require qualified development engineer (degree or equivalent) for interesting and varied work on telephone and electronic equipment. Design and practical experience essential. Write fullest particulars to—539, Wandsworth Rd., London, S.W.8. 5187

BUYER, male or female, for electric control gear works in South-East London. Must have experience of small electro-mechanical apparatus, stock control, etc. Reply stating age, experience and salary required to—Box 5411.

CHARGEHAND required by Telephone Manufacturing Co. Ltd., Martell Road, West Dulwich, London, S.E.21, to assist in controlling large coil winding section. Previous experience of coil winding essential. Preference will be given to applicants who have worked in the telephone industry. The position offers scope for advancement to the right type of man. Staff status. Good conditions of service. Pension and staff bonus scheme after qualifying period. Write, call or telephone—Personnel Department (Gipsy Hill 2211). 5304

CONTRACT engineer required by Bruce Peebles & Co. Ltd., Edinburgh, for their hydro-electric section. Applications are invited from engineers with experience in handling comprehensive contracts and also from young engineers with good engineering background, technical education up to H.N.C. standard and who have completed their National Service. Apply to—Mr. V. P. Mackay, " R " Department Manager, at the above address. 5460

CONTRACT estimator required for handling enquiries for the supply and installation of electric cables for voltages up to 132 kV. Apply giving full details of past experience to —The Secretary, W. T. Glover & Co. Ltd., Trafford Park, Manchester, 17. 5373

CROMPTON PARKINSON Ltd., Doncaster, have a vacancy for a foreman in their f.h.p. motor winding section. Applications are invited from men with experience in this class of work and in the control of female operatives. Salary according to qualifications and experience. Write giving details to—Ref. OP. 5462

CROMPTON PARKINSON Ltd. invite applications for an assistant for the production test department. Candidates aged 23-26 should have obtained the Ordinary or Higher National Certificate in appropriate technical subjects and should preferably have had previous production or test experience. The company operates a superannuation scheme to which employees contribute when eligible. Salary paid will be according to age, qualifications and experience. Applications, stating age and giving details of past experience, should be sent to the Personnel Officer, Wheatley, Doncaster. 5461

DESIGN engineer required by consulting engineers for preparation of electric light and power schemes and specifications for all types of buildings. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles & Partners, 32, Old Queen Street, Westminster, London, S.W.1. 5453

DESIGNER of industrial lighting fittings. The Benjamin Electric Ltd., Brantwood Road, Tottenham, London, N.17, require first-class lighting fittings designer for new development work. Apply to the Chief Technical Engineer, giving full details of age, training, expce., sal., etc. 5353

DESIGNER-DRAUGHTSMAN required for design and development of test gear to meet production demands of thermionic valves and cathode ray tubes. Applicants should have good mechanical knowledge with previous experience in mechanical and electrical interlocks, component layouts for power supply units up to 50 kV, 50 cycles, and R.F. or induction heaters. Housing facilities available near factory area. Write stating age and full details of previous experience and technical training to —The Edison Swan Electric Co. Ltd., Eastern Industrial Area, Harlow New Town, Essex. 5390

DRAUGHTSMAN, electrical, with experience of A.C. and D.C. automatic motor control gear. Altrincham district. State qualifications and salary required.—Box 5161.

DEVELOPMENT engineer required for voltage regulating equipment and control gear. Well-established company North London area. Write stating age, experience and salary required.—Box 5374.

DRAUGHTSMAN accustomed to the layout of all types of lighting and power installations for industrial and business premises. West London area. Apply stating age, experience and salary required to—Box 5270.

DRAUGHTSMAN required by consulting engineers for the reproduction of electric light and power schemes. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles and Partners, 32, Old Queen Street, Westminster, London, S.W.1. 5454

DRAUGHTSMAN required for detailing mechanical and electrical assemblies. Must be capable of reading electronic circuits. Applicants with any previous experience on sheet metal cubicles, H.V. power supply units, induction heaters or radio and television layouts should write stating age and full details of previous experience and technical training. Housing facilities available near factory area. —The Edison Swan Electric Co. Ltd., Eastern Industrial Area, Harlow New Town, Essex. 5391

DRAUGHTSMAN required for light engineering work, with experience on electrical and mechanical mechanisms.—Box 5375.

DRAUGHTSMAN required immediately for instrumentation work in connection with important government contracts. Ordinary National Certificate an advantage but not essential. Excellent conditions. 5-day week. Apply to—General Manager, Hendrey Relays Limited, 392, Bath Road, Slough, Bucks. 5463

DRAUGHTSMAN required with experience of metalclad medium-voltage switchgear. Unfurnished house available. A.E.S.D. rate minimum. Reply, stating age and experience, to—Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 5464

DRAUGHTSMAN (senior) required by Telephone Manufacturing Co. Ltd., Martell Road, West Dulwich, London, S.E.21, with experience of telecommunication apparatus. Pension and staff bonus schemes after qualifying period. Apply — Personnel Department (Tel. Gipsy Hill 2211). 5451

DRAUGHTSMEN. Previous experience in motor control equipment circuit work helpful but not essential if applicants are up to O.N.C. standard. Good salary and prospects. For successful applicants requiring housing accommodation, assistance may be given for skilled and key personnel. Pension scheme; 5-day week; canteen. Details of age, experience, qualifications and commencing salary to —Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 5159

DRAUGHTSMEN required by South Wales Switchgear Ltd. at their Blackwood works for high-voltage switchgear contract works and diagram sections. Applications giving full particulars of experience, qualifications and salary required to—The Personnel Manager. 5274

DRAUGHTSMEN required. Excellent opportunity to broaden experience with well-established company, whose wide range of products avoids restrictive specialisation. There are vacancies for seniors and juniors with at least Ordinary National Certificate. On well served transport routes. Near City centre and amenities. Saturday interview if required. Apply—Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5012

DRAUGHTSMEN required for mechanical design of compressed air components. Some mechanical experience essential. Applications, giving details of experience, age, etc., should be addressed to the Personnel Manager, Metropolitan-Vickers Elec. Co. Ltd., Trafford Park, Manchester, 17. 4913

DRAUGHTSMEN required for work on large electrical rotating machinery. Expericene on the class of work will be an advantage but is not essential. Interesting work on an expanding programme. Pension scheme and attractive salaries are available for successful applicants. Envelopes should be endorsed "Large Elec. Machine D.O." and addressed to —The Personnel Manager, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, 17. 5397

ELECTRIC lighting fittings manufacturers (London, old-established) have vacancy for representative. Connection essential. Commencing short period on commission.—Box 5267

DRAUGHTSMEN, sound experience of detailing light mechanical equipment, required by large engineering organisation in London. Salary not less than £11 10s. per week. Pension scheme, good promotion prospects, excellent conditions. Please write giving full particulars of experience and qualifications to—Box 5327.

DRAUGHTSMEN, sound knowledge of electrical engineering, required by consulting engineers for permanent positions in their Bath offices. Good salary, excellent conditions, pension scheme. Please write, giving full particulars of experience and qualifications, to—Box 4968.

ELECTRIC cable plastic extrusion operator required by a well-known Enfield manufacturer. Write in the first instance, stating age and experience, to — Box R.484, c/o Streets, 110, Old Broad Street, London, E.C.2. 5426

ELECTRICAL contractors require first-class neon erector and also skilled electrician for Midlands area.—Box 5354.

ELECTRICAL draughtsman required by Glasgow firm of engineers for new development project. Five-day week, canteen and superannuation scheme in operation. Written applications desired in the first instance outlining technical education (which should be to at least O.N.C. standard), previous drawing office experience and salary required. Write—2992, Wm. Porteous & Co., Glasgow. 7661

ELECTRICAL/electronic engineer required to take charge of small laboratory. Applicant must have some years' experience in laboratory of manufacturers or large-scale users of any of the following: Cables, capacitors or insulation materials. Maximum age 35. London, E.11 district. Write fullest particulars.—Box 5242.

ELECTRICAL engineer wanted. McLellan & Partners, consulting engineers, have a vacancy on planning and supervision of cabling and plant installation in a large works in South Wales. Salary £650-£900, depending on experience. Write to 32, Victoria Street, London, S.W.1, giving age, education, qualifications and details of experience. 5248

ELECTRICAL research engineers and electrical research assistants required in the electrical laboratories of C. A. Parsons & Co. Ltd., Heaton Works, Newcastle upon Tyne, 6. Vacancies occur in research groups engaged in high-voltage work, insulation of large electrical machines, and in vibration, strain and the development of special electronic devices relating to mechanical measurements. Applicants for the posts of research engineers should possess at least a degree or its equivalent in electrical engineering, and for the post of research assistants possess the H.N.C., O.N.C., or its equivalent. Prior consideration will be given in each case to applicants who have completed a recognised engineering apprenticeship and have also completed their term of National Service. Good commencing salaries and excellent opportunities for advancement for men with initiative. Pension scheme in operation. Apply in writing, giving age and full chronological details of qualifications and experience, to—The Personnel Manager. 5412

ELECTRONIC engineers required. Excellent opportunity for men of degree standard to broaden experience in a field of great interest and variety and involving latest techniques. Restrictive specialisation can be avoided by joining Marconi Instruments Limited who produce light current communications, measuring and test apparatus for a wide range of requirements. Saturday interview if required. Apply Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5014

ELECTRONICS engineer required by Middlesex firm of manufacturing chemists. Applicant should be qualified mechanical or electrical engineer with experience of factory engineering allied to electronic controls. Post offers excellent opportunity to man with progressive outlook. Write giving fullest details of age, qualifications, experience and salary required to—Box 5355.

ENGINEERING laboratory assistant required for the development of a wide range of electrical test equipment. Salary minimum £11 5s. per week at age 25. Applicants should have H.N.C. (Elect.) and preferably served an engineering apprenticeship and a knowledge of electronics. Write giving details of age and experience to—The Employment Officer, Hoover Ltd., Perivale, Middlesex. 5356

ELECTRICAL engineer required to take charge of engineering experimental dept. Previous experience testing elec. motors essential. Minimum qualifications H.N.C. in Electrical Engineering. 5-day week. Pension and life assurance scheme. Please apply in writing to—Personnel Manager, Ranco Limited, Newhouse Industrial Estate, Lanarkshire. 5465

ELECTRICAL wholesalers require pricing clerk. Previous experience desirable. Gd. salary and pension.—London Electrical Co., 92, Blackfriars Road, London, S.E.1. 5280

ENGINEER required for the development of a wide range of fractional horse-power motors. Experience of this work and H.N.C. (Elect.) or equivalent essential. Salary approximately £700 to start. Candidates, aged 25 to 35, should apply in writing, stating age, education, qualifications and experience, to—The Employment Officer, Hoover Limited, Perivale, Middx. 5357

EXHIBITION contractor requires branch manager for electrical dept. Please state full particulars, experience, age and salary, in strict confidence.—Box 5392.

FOREMAN supervisor experienced overhead transmission lines and cable work for contractors working Midlands and Southern England. Possibility of transfer abroad later Write details age, experience.—Box 5409.

FULLY trained lighting engineer required for London office. Applicant must have good education and preferably be a member of the I.E.S. Apply—Senior Lighting Engineer, Ekco-Ensign Electric Ltd., 45, Essex Street, Strand, London, W.C.2. 5243

HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd., Walton-on-Thames, Surrey, require the services of a research and development engineer with some experience in motor speed control as applied through mercury arc rectifiers. Apply—Research Engineer. 5207

HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd., Walton-on-Thames, Surrey, require the services of an engineer experienced in the design and production of instrument transformers and small power transformers. This is a senior position offering considerable scope. Applications should be made direct to the Chief Engineer. 5208

HOUSECRAFT adviser/cookery demonstrator with first-class experience and training is required at the Southampton branch of the G.E.C. Preference will be given to applicants with E.A.W. Certificate and experience of demonstrating electrical equipment. Applications in writing should give full details of age and record and be sent to the Staff Manager, The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2, quoting ref. S.B. 5393

HOUSING assistance will be offered to electrical foreman with wide production experience in radio industry of small and medium electrical control gear manufacture, test and installation required by manufacturers of materials handling vehicles. Pleasant country district, 1 hour London. Good prospects of advancement; canteen and social facilities. Please write giving details of past experience, present salary, salary required, married/single, to—Box 5358.

IMPERIAL CHEMICAL INDUSTRIES Limited, Billingham Division, has vacancies for young mechanical and electrical engineers. For these vacancies a good honours degree is necessary, and research or previous industrial experience is desirable but not essential. Candidates at present serving in H.M.F. and who expect to be demobilised during the next few months can be considered. Appropriate experience in H.M.F. will be considered an asset, but further practical training can be arranged where necessary. The vacancies are in the production, maintenance, design, development and research departments, and offer excellent prospects of advancement. Write, giving full details, to the Staff Manager, Imperial Chemical Industries Limited, Billingham Division, Billingham, Co. Durham, quoting advertisement ref. T.7. 5455

INSTRUMENT sales engineer, H.N.C. standard, pref. with exp. of industrial applications of elec. instruments and controls, reqd. as senior assistant in sales dept. (London area). Must have initiative and be prepared to accept responsibility. Applications in schedule form with details of qualifns., exp., sal. to—Box 5376.

LIFT engineer required, good training essential, able to supervise erection and maintenance. Write full details to—Box 5467.

JIG and tool draughtsman required on light engineering products; knowledge of general press work, milling and fixture design; A.E.S.D. minimum rates, superannuation. Canteen and welfare facilities. Apply—Personnel Manager, Simplex Electric Co. Ltd., Broadwell Works, Oldbury. 5466

JOINTER, first-class H.T. plumber-cable, required for 12 months' overseas service by firm engineers and contractors. Write stating experience, age, references.—Box 5275.

JUNIOR designers required to deal with small transformers, power, audio, pulse, etc. Specialised training will be given to engineers with suitable basic training and experience. Applications to — Technical Director, Gresham Transformers Ltd., Twickenham Rd., Hanworth, Middx. 5324

JUNIOR electrical engineer required for small firm in N.E. At least up to H.N.C. standard with experience of motor control gear and an understanding of schematic and wiring diagrams. Ability to supervise electrical testing and instrument calibration an advantage. State age and salary required. Reply—Box 5279.

LEADING oil company requires one electrical engineering draughtsman for work in the Middle East. Age 25-30 years. Candidate should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualifications. An engineering apprenticeship is required which includes 3 years' practical experience in the shops followed by 3-5 years in the drawing office on electrical installations for process plants, workshops and/or factories. Attractive salary plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme. Write, stating age and full details of qualifications, quoting F.500, to—Box 1264, c/o 191, Gresham House, London, E.C.2. 5359

MARCONI INSTRUMENTS Ltd. have an immediate vacancy at St. Albans in their technical literature (telecommunications) section. The applicants should have electrical engineering qualifications and/or experience in the design or development of electronic equipment. The duties are varied and interesting and the post provides a permanent and pensionable position in a well-established company. Apply —Messrs. Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5468

MECHANICAL engineer required by cable works for production machine experimental and development work. Minimum qualification H.N.C. Age limits 30 to 40 years. The prospects are good and this is an opportunity for a man who likes to see the results of his ideas put into practice. Commencing salary according to qualifications and experience. Pension scheme. Apply, in confidence, giving particulars in chronological order, to—Works Manager, Southern United Telephone Cables Ltd., Dagenham Dock, Essex. 5417

ORDER clerk required, age 21-25 years, for motor and plant department. Previous experience preferred but not essential. Good opportunity for progress. Pension scheme, 5-day week. Write stating age and previous experience to—Box 5413.

PERSONNEL required for sales office, male or female. Superannuated position. Some previous experience necessary.—Progress Cables & Accessories Co. Ltd., Regent House, Eversholt Street, London, N.W.1 (Euston 5588). 5053

PLANNING engineer required by the Telephone Manufacturing Co. Ltd., Martell Road, West Dulwich, London, S.E.21, with experience of pre-production planning of light electro-mechanical components. Applicants should have reached H.N.C. standard and possess a sound knowledge of production methods. Staff pension and bonus schemes after qualifying period. Five-day week. Apply in writing to Personnel Department. 5452

QUALIFIED design and development engineer required by small but expanding company manufacturing control switchgear, specialising in limit, micro and rotary switches, in Birmingham area. Excellent prospects for advancement. Write stating past experience, qualifications and age to—Box 7632.

REPRESENTATIVE required for two associated small companies covering electro-mechanical engineering as applied to electronic equipment and transformers. S.W. London area. Write, stating previous experience and suggested manner of remuneration to —Box 5250.

POWER house drivers required for driving mixed pressure turbines with auxiliaries and to run conversion plant. Duties also extend to operation of switchgear but not maintenance. Good rates of pay. 63½ average hours paid per week on a 48-hour rotating cycle shift of 6 shifts per week. Some training given but applicants should have had similar experience. Apply—Personnel Manager, Shelton Iron, Steel & Coal Ltd., Stoke-on-Trent. 5360

QUALIFIED electrical and mechanical engineers, age from 25/32, with some commercial and technical sales experience, preferably public school or university, required by well-known public company in the West of England to fill executive positions in export division at home and overseas. These appointments offer considerable scope for early promotion. Applications will be treated in strict confidence. Commencing salary £750 per annum according to experience.—Box 5284.

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REQUIRED in Monmouthshire, an electrical engineer to take charge and be responsible for the running, upkeep and maintenance of electrical power plant, electrically driven excavators and drilling machines. Long-term contract.—Box 5469.

RESEARCH laboratories, near London, seek keen young electrical engineer for development work on high-voltage cables. Experience an advantage but not essential. University graduate or equivalent. National Service completed. Superannuation scheme.—Box 5377.

SENIOR electrical draughtsmen required with sound experience in power wiring and layouts for process plant. Applications in writing, giving full personal details, to—Ilford Limited, Romford, Essex. 5394

SERVICE engineers required, Higher National Certificate standard, for servicing electronic computors and servo-mechanisms for flight simulators. Successful applicants will be considered for housing after probationary period. Full details to—Personnel Officer, Redifon Ltd., Kelvin Way, Crawley, Sussex. 5415

SHORTHAND typist (English, female) wishing to learn German, preferably experienced in electrical engineering, required to work in Switzerland for minimum one to two years. Good knowledge English essential. Write stating age and full particulars to—The Secretary, Oerlikon Ltd., Victoria House, Southampton Row, London, W.C.1. 5362

SOUTH Africa. Established company has vacancy for shift charge hand in the paper-lapping and layup sections of its dry core telephone cable plant. Single man preferred. Pension and other welfare amenities available; passage paid. Applications should give full details of previous experience and qualifications and will be treated in confidence.—Box 5198.

STEEL erectors for contractors engaged steel tower line, Midlands area.—Box 5410.

STOREMAN, electrical, required by wholesalers for receipts and issues. Apply giving details of experience, wage required, to—E. Dawson (LF) Ltd., 10, Grays Inn Road, London, W.C.1. 5363

TECHNICAL engineer (electrical) required by Glasgow firm of manufacturing engineers to assist in design and development work on an important new project. Applicants should be honours graduates in electrical engineering with a few years post graduate industrial experience. Written applications are desired in the first instance outlining technical education, qualifications and experience and approximate starting salary required. A superannuation scheme is operated. Write 2993, Wm. Porteous & Co., Glasgow. 7660

TECHNICAL sales correspondents are required by Sangamo Weston Ltd. Applicants should preferably have had previous engineering and commercial experience in connection with electrical measuring instruments, but those similarly employed in some other branch of the light electrical engineering industry will be considered. Age desirably 25/35 years. Applications in writing to—The Employment Manager, Great Cambridge Rd., Enfield, Middx. 5283

STREET lighting estimating clerk required by well-known manufacturing electrical engineers in Central London. Applicants must have knowledge of street lighting equipment. Preference will be given to applicants accustomed to preparing quotations. Superannuation scheme. Apply stating age, experience and salary required to—Box 5395.

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TECHNICAL assistants (electronic). Men required of Final Certificate City and Guilds Telecommunications standard and with experience in VHF and UHF. Men with compensating experience in these frequencies can be considered. Opportunity to broaden experience and avoid restrictive specialisation. Saturday interview if required. Apply Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 5013

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THE BRITISH THOMSON-HOUSTON Co., Ltd., invite applications for the position of assistant manager, lamp sales and lamp and lighting salesmen aged between 23 and 40 years. G.C.E. standard of education. Applications giving full details in writing to Room 603 (EJM), B.T.H. Co. Ltd., Crown House, Aldwych, London, W.C.2, marked Personal, which will be treated in strictest confidence. 7658

TIME study and rate fixing engineer. Applicants, between the ages 25 to 35 years, must have had experience in this type of work, and be conversant with trade union procedure. Salary according to age, qualifications and experience. Pension scheme. Apply, in confidence, giving particulars in chronological order to — Works Manager, Southern United Telephone Cables Ltd., Dagenham Dock, Essex. 5416

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TRANSFORMER designer for small transformers, etc., of all types up to 5 kVA. Experience of A.I.D. and Govt. specs. and estimating an advantage. Old-established manufacturers on South Coast.—Box 5419.

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TRANSFORMER draughtsman, experienced up to 10 MVA, 33 kV. Progressive appointment. Pension scheme. Write stating age, salary and experience to — Yorkshire Electric Transformer Co. Ltd., Dewsbury. 5378

TRANSFORMER draughtsman for all types up to 500 kVA, for rapidly expanding company in Surrey. Situation offers excellent opportunity for advancement. Good commencing salary. House could be arranged. Reply in confidence.—Box 5331.

TRANSFORMER draughtsmen required, fully experienced up to 2,000 kVA, 66 kV; 5-day week, pension scheme. Apply to Chief Mechanical Engineer, Hackbridge and Hewittic Electric Co. Ltd., Walton-on-Thames, Surrey, giving details of experience and salary required. 5422

TWO chemists required in the laboratories of electric cable makers for work controlling raw materials, processes and finished products. Age about 25 years. Graduate or A.R.I.C. standard preferred. H.N.C. lowest acceptable standard. Salary according to age, qualifications and experience. Apply giving full details to—The Secretary, W. T. Glover & Co. Ltd., Trafford Park, Manchester, 17. 5420

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A.C. and D.C. motors, new and reconditioned. Diesel alternator sets, generators, transformers, welders, plating equipment, switch and control gear, etc. Stock list post free.—Thos. W. Ward Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). 5488

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A.C./D.C. meters.—The Electric Meter Co., Dept. ER46, Castle Circus House, Torquay. 7627

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HOOVER portable blowers, 230 v., A.C., new, in case complete with 8 ft. hose and flex, 9" w.g. pressure. £6 5s. ea.—J. S. Ramsbottom & Co. Ltd., Keighley. 66

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HOUSE service meters.—The Electric Meter Co., Dept. ER46, Castle Circus House, Torquay. 7629

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METERS, reconditioned, all types, AC/DC, quarterly credit, single or three-phase, 3/4-wire, 2½/100-amp. Prepayment single, dual and triple coin, fixed or variable tariff, 2½/50-amp. Delivery ex stock, guaranteed, free catalogue lists 200 types. Trade discount 33⅓%.—The Electric Meter Co., Dept. ER/46, Castle Circus House, Torquay (Tel. 7963). 7626

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MOTORS. Large stock all types, reconditioned, at one half makers' price, ½ to 300 h.p. Switchgear available.—J. S. Ramsbottom & Co. Ltd., Keighley (3744/5/6). 46

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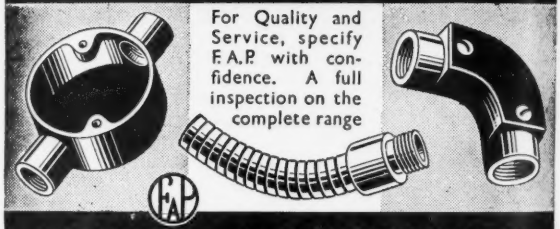

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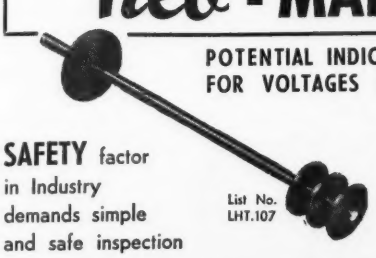

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Designed for vertical and horizontal isolation switchgear
SAFETY factor in Industry demands simple and safe inspection
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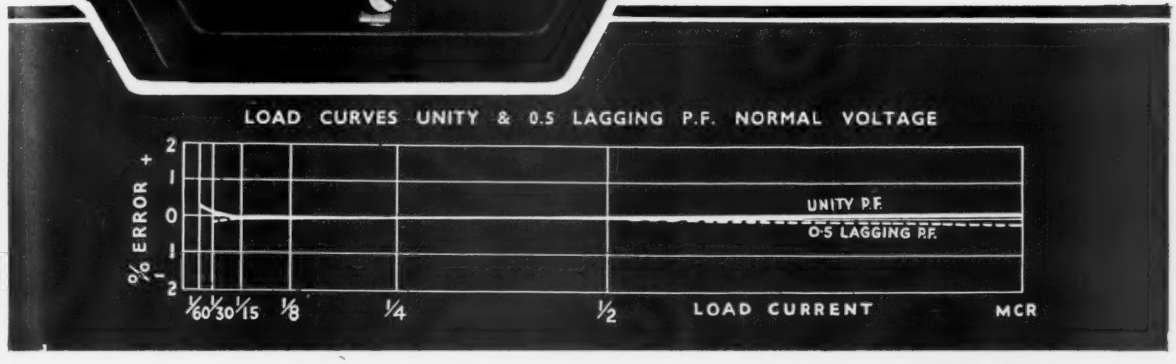
Denis Ferranti Group

QUALITY DELIVERY

THE TM3 METER



The TM3, a maximum current rating meter, is the latest development of DENIS FERRANTI METERS LTD. It complies with B.S.37, Parts 1 and 2, 1952.

No sliding contacts on any adjustments.

Voltage and current losses are low, without any sacrifice of accuracy, from M.C.R. down to less than 1/60 M.C.R.

The Meter with the most efficient magnet system in the world.

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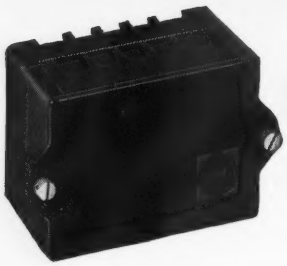
TELEPHONE: BANGOR, 860. BANGOR AND PENYGROES NORTH WALES TELEGRAMS: DEFERRANTI, BANGOR

For neater and more efficient installations

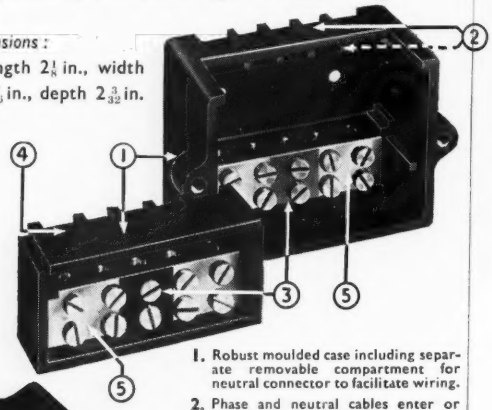


HENLEY
CONNECTOR BOX

MULTI-WAY DOUBLE-POLE INSULATED

This box is designed for all situations where a number of sub-circuits are required to be connected to a main circuit as commonly experienced in domestic, commercial and similar installations such as at metering positions. The two connectors are separately housed and are arranged so that the phase and neutral cables for each circuit leaving or entering the box are adjacent to each other, thus providing neat and straight-forward wiring.

Dimensions :
length $2\frac{1}{8}$ in., width $3\frac{7}{16}$ in., depth $2\frac{3}{32}$ in.



1. Robust moulded case including separate removable compartment for neutral connector to facilitate wiring.
2. Phase and neutral cables enter or leave adjacent to each other.
3. Phase and neutral identification.
4. 'Knock-out' diaphragms for each cable entry.
5. Five-way connectors, two ways up to .04 sq. inch and three up to .0225 sq. inch, fitted with two tinned brass pinching screws for each conductor.
6. Reversible moulded cover retained by two captive screws with provision for sealing.

Ask for folder 43/A

HENLEY
INSULATED SERVICE FUSES

100 AMP now available

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The range consists of single-pole fuses and double-pole and four-pole fuses with combined Sealing Chambers. Separate Connector Boxes and Sealing Chambers are also available for use with the single-pole fuses.

Ask for folder 43/B

These are two interesting items from the extensive range of HENLEY Insulated Service Fuses, Connector Boxes, etc.

Please write for Catalogue 43

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